

CPU™

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Intel At The
Core
Of The
Apple
G4

(page 97)



* Mozilla 1.0
Is Finally Here

(page 64)

* Overclock Your
CD-RW
Drive

(page 94)



* Lindows'
Michael Robertson
Talks Windows

(page 108)

* AGP 8X
Prepped For
Prime Time

(page 40)

Regular Columnists

- ▶ Anand Lal Shimpi
- ▶ Alex "Sharky" Ross
- ▶ Kyle Bennett
- ▶ Chris Pirillo
- ▶ Pete Loshin
- ▶ Lisa Lopuck
- ▶ Rob "CmdrTaco" Malda
- ▶ Joan Wood
- ▶ Alex St. John

Hardware Reviews

- ▶ Sony DRU-120A DVD+RW
- ▶ HP dvd200e DVD+RW
- ▶ Apple iBook 700MHz G3
- ▶ CyberPower Titanium Gamer Force Pro

October 2002

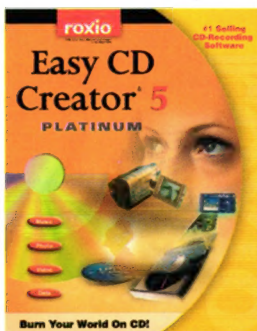
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CHASING HACKERS

- Kevin Mitnick On Getting Caught (page 56)
- White Hat vs. Black Hat (page 54)
- How To Protect Yourself (page 58)
- Inside DEF CON (page 52)

room to burn



VINYL



DIGITAL VIDEO



DATA BACKUP



ORIGINAL MUSIC



DIGITAL PHOTO



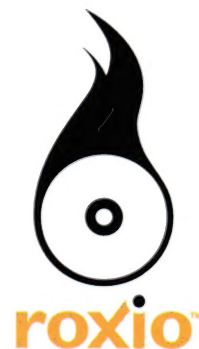
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HACKERS

Spotlight

48

Today's Hacker:

Heavenly Or Bound For Hell?

52

Welcome To DEF CON 0A

The Bandwidth Is As Free As The Info

54

Black & White

Hackers Wear Many Hats

56

Hacker Tracking

Lines Blur As Law Enforcement Steps Up Its Efforts

58

Thwart Intruders On Your PC

Plug The Holes Hackers Look For

Frontside

- 6 What's Happening
- 12 Digital Economy
- 13 **The Saint**
The Future Of Your CPU

The Experts



Kyle Bennett
[H]ard Talk
page 34



Alex "Sharky" Ross
The Shark Tank
page 33



Alex St. John
The Saint
page 13



Rob "CmdrTaco"
Malda
**The Department
Of Stuff**
page 79



Anand Lal Shimpi
Anand's Corner
page 32



Pete Loshin
Open Sauce
page 68



Joan Wood
Forward Slash
page 80



Lisa Lopuck
Site Scene
page 78



Chris Pirillo
Dialogue Box
page 67

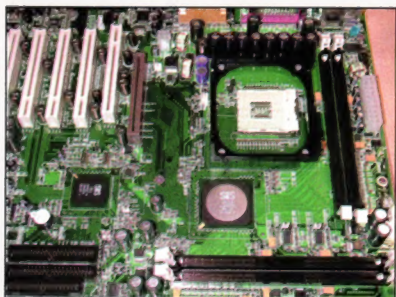
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Did you find the hidden CPU logo on our cover?
Turn the page for the answer.



Heavy Gear

- 14 **Extreme Hardware**
These Gizmos Don't Sing It, They Bring It
- 18 **First Look:** NVIDIA nForce2
- 19 **First Look:** SiS R658 Chipset
- WEB First Look:** Intel Portable Video Player
- 20 ATI Radeon 9700 Pro
- 21 Sony DRU-120A 2.4X/2.4X/8X DVD+RW
Epson Perfection 2400 PHOTO
- 22 Palm i705
Sharp Zaurus SL-5500
- 23 HP dvd200e 2.4X/2.4X/8X DVD+RW
Sony GDM-FW900
- 24 C-Technologies C-Pen 800C
Panasonic SV-AV10
- 25 Argus DC-3300
Samsung ML-1430
- 26 CyberPower Titanium Gamer Force Pro
- 27 Apple iBook 700MHz G3
- 28 Dell Dimension 4500
- 29 Plextor PlexCombo 20/10/40-12A
Samsung SM-332 Combo 32X/10X/40X
CD-RW 12X DVD-ROM
- 32 **Anand's Corner**
Trident's XP4: A \$99 GeForce4?
- 33 **The Shark Tank**
Summer Catch Up
- 34 **[H]ard Talk**
SiS Is Getting Serious



Hard Hat Area

- 36 **The PC Challenge:** Best Video Editing System For Less Than \$2,000



- 38 **Swappin' Parts**
MERLE's Swan Song
- 40 **X-ray Vision:** Is 8X The Last Of AGP?
- 42 **White Paper:** Radeon 9700
ATI Gets A Leg Up In The Graphics Race

Loading Zone

- 62 **The Bleeding Edge Of Software**
Inside The World Of Betas
- WEB Hey, I'm Talking Here**
ScanSoft Dragon NaturallySpeaking 6
- 64 **There's A New Browser In Town**
Mozilla 1.0
- 66 **Sun's Bright Shiny Star**
StarOffice 6.0
- 67 **Dialogue Box**
Don't Kill The Shareware Industry
- 68 **Open Sauce**
22 Short Reviews, Part 2

Caught In The Web

- 70 **Fringe**
- 72 **The Motley Fool**
Forget What You Know
About A Fool & His Money
- 76 **Coder's Corner: XML**
Device-Independent Forms With XForms
- 78 **Site Scene**
Web User Testing: Part I
- 79 **The Department Of Stuff**
bandwidth.txt
- 80 **Forward Slash**
Drive-by Prototyping



Digital Living

- 82 **Road Warrior**
Step Up To 3G, Buying At The Mall,



- Pocket PC Phones Arrive, Dangerous News & More From The Mobile Front
- 84 **At Your Leisure**
Plug In, Sit Back & Fire Away

Tips & Tricks

- 88 **Software Tips & Projects**
Office XP Hijinks
- 92 **Warm Up To Penguins**
Get To Know Your Network Traffic
- 94 **Killer Hardware Tips**
Too Cool To Follow Rules
- 97 **One Rotten Apple**
A Case That's Fallen A Long Way From The Tree



What's Cooking

- 103 **Technically Speaking**
An Interview With Yrjo Neuvo, Ph.D.,
Nokia Executive Vice President & CTO
- WEB Interview with Paul Ceruzzi, author of "A History Of Modern Computing"**
- 106 **Under Development**
A Peek At What's Brewing In The Laboratory



Back Door

- 108 Q&A With Michael Robertson

Infinite Loops

Strange stats and other
oddball items from
computing's periphery

70, 87, 90, 95, 102



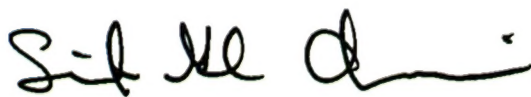
GREETINGS FROM SAMITLAND

In many people's minds the word "hacker" conjures up fear, vandalism, and a host of other negative connotations. The media loves to sensationalize script kiddie pranks, and it gives these little punks more space than they deserve. That's not to say all hackers are good; it's just that people need to reserve judgment based on the individual. Hackers play many legitimate and beneficial roles in the world of computing today. And let's not forget how David Lightman (who looked remarkably like Matthew Broderick) saved the world. His exploits in averting a nuclear war are presented in a little-known documentary known as "WarGames." More seriously, join us on page 52 for an inside track into the world of hackers; we even sent one of our own to DEF CON 10 to give you the scoop. And don't miss our thoughts on methods you can use to thwart intruders on your PC.

Now jump over to page 97 and check out the Rotten Apple. I've always commented to friends how great it would be to have an Apple G4 case with a hot rod PC on the inside. Apparently, others had the same idea. I was chatting with Kyle Bennett (HardOCP.com) about this one day, and it seems that he had been thinking along the same lines. But one better: Kyle had managed to procure a pristine G4 case from Ireland. Lucky bloke. If you manage the same feat, you'll be thankful for Brian Holmes' step-by-step Apple-to-Wintel conversion. It's not for the weak of heart. Check it out and feel the envy rushing through your veins.

Hey, and look at that: I racked up a loss in PC Challenge (page 36). However, I'll give kudos to Michael for some innovative thought. But guess what? I'd stick by my PC for video editing any day. Remember, M. Night Shyamalan (of "The Sixth Sense" and "Signs" fame) is of Indian origin. Hey, and so am I. Plus I now have directorial chops. (Don't chuck those MFM drives at me yet!) 'Nuff said. (OK, *now* throw 'em.)

All right folks, hope you like what you see. Let us know what you think. I'm getting married soon, so off I go. I'll be a married man when you see me next. Ta.



Samit G. Choudhuri, Publication Editor, CPU



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Hours

Mon. - Fri.: 8 a.m. to 8 p.m. (CST)
Sat.: 8 a.m. to 4 p.m. (CST)

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x-tra Dinky?

Sci-fi writers have long milked the idea of technological advances taken to their logical conclusions, such as androids indistinguishable from humans. We



would suggest that if flash memory cards get much smaller, users will be in danger of losing them as easily as their pocket change. Witness the penny-sized xD-Picture Card from Fujifilm and Olympus. At this writing, Toshiba is manufacturing cards as big as 128MB for use in new digital cameras, such as Fujifilm's FinePix 3800. 256MB cards should appear by year's end; 8GB is on the roadmap. ▲



At just 0.79 inches high x 0.98 inches wide x .067 inches deep, the tiny new xD-Picture Card

can record as much as 5MBps in its 64MB and greater incarnations.



COURTESY OF APPLE

HP Burns A Bridge To Dell

In late July, HP ended an agreement that let Dell sell HP printing and imaging products on Dell's site. "We concluded that the basis for the partnership with Dell was no longer valid given the company's plan to move from a multivendor strategy to a Dell-branded approach," said HP spokeswoman Diane Roncal.

Dell spokesman Mike Maher confirmed that the company has long been considering selling new types of devices, such as printers, under the Dell brand. Replacement inkjet cartridge sales have been a bulwark against declining revenues for printer giant HP, making printer sales appear attractive to Dell and others. At this writing, Dell still listed 160 HP products for sale on its site. ▲



HP printers such as this one will no longer be sold on Dell's site.

One Bad Apple Announcement Spoils Bunch

Apple made lots of fans happy with a bushel of new products at MacWorld Expo in July. Among them was "Jaguar," the new version 10.2 of Apple's OS X desktop and server operating systems; iPods as big as 20GB compatible with both Mac and Windows; and a \$1,999 iMac with a 17-inch LCD. Next, Apple made a lot of users unhappy by ending iTools and users' free Mac.com email accounts in favor of a new \$99.95/year service called .Mac. Existing iTools users get a half-price deal the first year, but some announced plans to jump ship to cheaper third-party alternatives, such as a \$9.95/year account at Macsrule.com or MacOSX.com. ▲

Will a 17-inch-LCD-clad iMac make up for the end of iTools?

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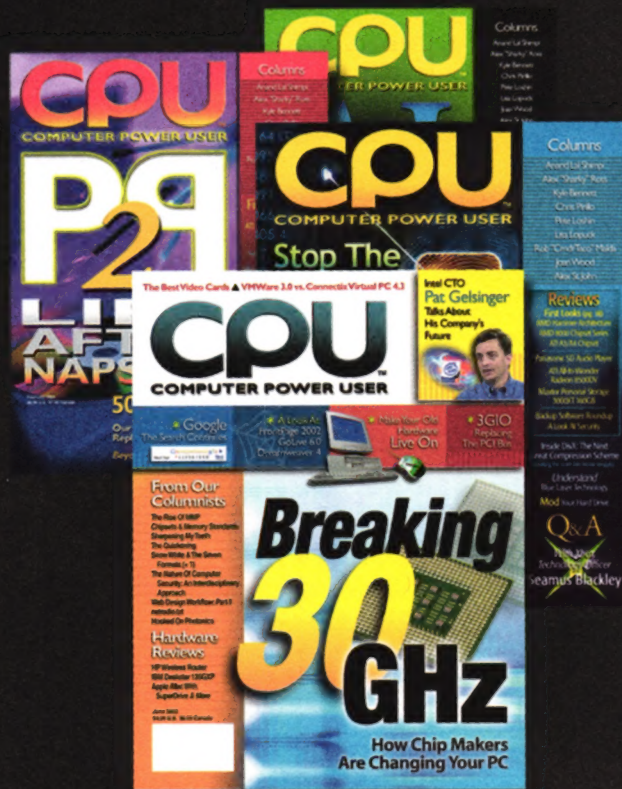


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Hardware Mole

Our endearingly myopic hardware mole always has one ear to the ground. Here's his scuttlebutt at press time.

New Flash Memory Security

By the time you read this, a consortium of companies including Toshiba, SanDisk, and Hitachi may have released a new security standard for flash memory cards. The 5C consortium, which also includes Matsushita and Ingentix, is developing the Mobile Commerce Extension Standard (MC or Mc-EX) in a bid to help flash memory become a trusted vehicle for secure shopping and sensitive data transfers. 5C plans to license MC to memory card and device manufacturers beginning in October. ▲



The new, format-agnostic Mobile Commerce (MC) Extension Standard will help

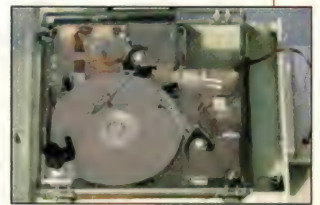
secure CompactFlash, Secure Digital (SD), Multimedia Cards (MMC), and others.

Mobile Graphics On The Rise

Notebook graphics chips gained a bigger chunk of the market compared to PC graphics chips in the last year, according to a Jon Peddie Research report. The research firm says notebook display controllers totaled 19% of all graphics chips in Q1 of 2002, up 5% from Q1 2001. Increased mobile computer sales and more satisfactory graphics integrated in PC motherboards may both have played a role. The firm also found that the x86 computer market absorbs 30% more graphics chips than CPUs, although it's not so surprising when you consider that many computers ship with both integrated graphics and a higher-performance AGP card. ▲

One Hard Drive, Two Head Assemblies

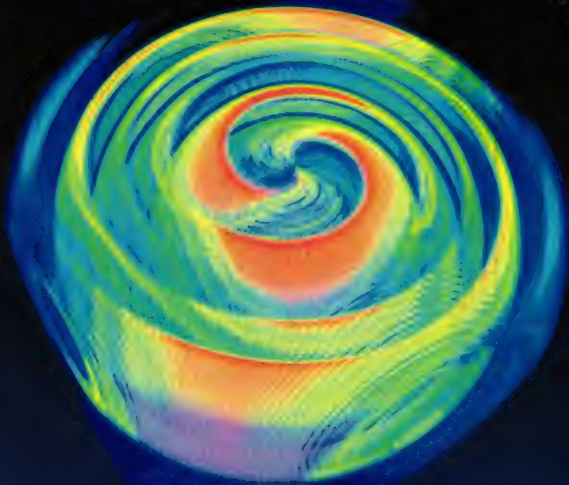
Naoto Takano, chief executive of Japanese company Scarabs Corporation, has developed a prototypical server hard drive that's proof against many outside attacks involving writing or deleting data. The drive has two armature assemblies instead of one.



If only a read head is remotely accessible on a server drive, it could thwart attacks such as site defacements.

One, accessible from the Internet, has a read-only head. The other, bearing a traditional read-write head, is for system administrators only. Of course, Takano's invention doesn't prevent remote data theft, DoS attacks, or even sabotage by insiders, but it's still a step in the right direction. ▲

When Black Holes Collide



Proof of gravitational waves' existence would shed light on the universe's origin. However, only rare celestial events, such as the collision of two black holes, might produce waves detectable here on Earth. Researchers from NASA, the University of Texas, and the Theoretical Astrophysics Centre in Copenhagen, Denmark, recently presented their findings from the most complex computer simulation of a black hole collision to date. The simulation used a Hitachi SR-8000 supercomputer at the Leibniz Computing Centre in Munich, Germany, according to NASA's John Baker, along with SGI Origin and Xeon Linux systems in other locations. All in all, UT's Dr. Carlos Lousto said, the simulation took about 512 processors in 64 nodes, each performing about 50MFLOPs, and approximately 170GB of RAM. ▲

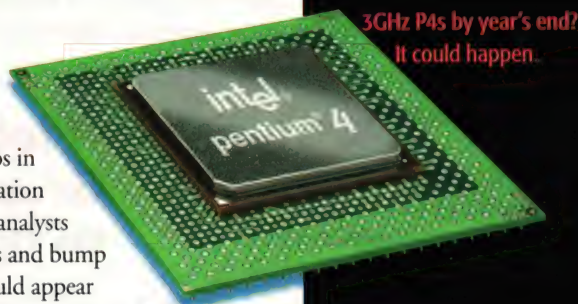
Here's an image from a computer simulation of two black holes colliding.

What's Happening **Chip Watch**

There's no sense blowing sunshine: About the only good news in this month's chip watch is the promise of faster processors coming up.

Intel To Cut 4,000 Jobs

Intel missed earnings forecasts for the second quarter by approximately two cents per share, despite a \$446 million net income. In a July release, Intel revealed that it expects to cut approximately 4,000 jobs in the second half of the year "primarily through attrition, voluntary separation programs, and some targeted business disinvestments." At this writing, analysts are expecting the silicon giant to cut prices on many of its desktop chips and bump up the release dates of upcoming Pentium 4s. The 2.8GHz version should appear before you read this, and the 3GHz model could ship before the end of the year.



3GHz P4s by year's end?
It could happen.

AMD Posts \$185 Million Loss

AMD also fell short of Wall Street's expectations in its second quarter results, released in mid-July. The processor and flash memory manufacturer posted a net loss of \$185 million, or about 54 cents per share, on total revenues of \$600 million. The company blamed slow PC sales for the drop in processor revenue. On the bright side, AMD said that its flash memory sales had improved 9% over Q1, and at this writing, had made no mention of layoffs.

AMD

High-end cell phones boosted
flash memory sales, AMD said,
but Q2 was nevertheless bleak.

Transmeta To Cut 40% Of Workforce

Transmeta posted its financial results for Q2 in mid-July, including a net loss of \$35.6 million, or 27 cents per share. That's nearly a \$5 million greater loss than the previous quarter, so the company also announced it would lay off 200 people, which is approximately 40% of its workforce. The restructuring is part of a bid to reach profitability by Q4 of 2003. Transmeta also announced a decision not to release its TM6000 design as a product anytime soon.



Transmeta pulled back from the TM6000, choosing to extend the TM5800's features and capabilities for now.

Watching The Chips Fall

Here's a rundown of the latest AMD and Intel CPU pricing information compared with initial release and last month's pricing.

CPU	Released	Original Price	Current Price	Last Month's Price
AMD Athlon XP 1600+	10/09/2001	\$160	\$61	\$64
AMD Athlon XP 1700+	10/09/2001	\$190	\$71	\$69
AMD Athlon XP 1800+	10/09/2001	\$252	\$80	\$80
AMD Athlon XP 1900+	11/05/2001	\$269	\$102	\$107
AMD Athlon XP 2000+	01/07/2002	\$339	\$121	\$127
AMD Athlon XP 2100+	03/13/2002	\$420	\$149	\$164
AMD Athlon XP 2200+, 0.13 micron	6/10/2002	\$241	\$203	\$239*
Intel Pentium 4 1.5GHz	11/20/2000	\$819	\$112	\$120
Intel Pentium 4 1.6GHz	04/23/2001	\$294	\$127.50	\$125
Intel Pentium 4 1.7GHz	04/23/2001	\$352	\$135	\$129
Intel Pentium 4 1.8GHz	07/02/2001	\$562	\$120	\$155
Intel Pentium 4 1.9GHz	08/27/2001	\$375	\$165	\$165
Intel Pentium 4 2GHz	08/27/2001	\$562	\$179	\$179
Intel Pentium 4 2.2GHz	01/07/2002	\$562	\$247	\$235
Intel Pentium 4 2.4GHz, 400MHz FSB	04/02/2002	\$562	\$348*	\$358*
Intel Pentium 4 2.26GHz, 533MHz FSB	05/06/2002	\$423	\$235*	\$265*
Intel Pentium 4 2.4GHz, 533MHz FSB	05/06/2002	\$562	\$360*	N/A
Intel Pentium 4 2.53GHz, 533MHz FSB	05/06/2002	\$637	\$550*	\$618*

* Retail price. Other current prices, if indicated, are lowest OEM prices available through Pricegrabber.com.

In Software . . .

Hey, I Think We Own JPEG

After years as arguably the most popular file compression format for digital photography on the Web, JPEG may soon become an unanticipated expense to hardware and software manufacturers. In July, Austin, Texas-based videoconferencing software developer Forgent Networks "clarified its licensing program" in reference to a patent it says covers all uses of JPEG except the satellite broadcast business. In a statement, Forgent claimed a "sole and exclusive right to use and license" all uses of the JPEG standard, including digital cameras, browsers, scanners, PDAs, and others.

Forgent acquired Compression Labs in 1997, and with it, U.S. Patent No. 4,698,672. This patent, "Coding system for reducing redundancy," ostensibly contains intellectual property that later made its way into the JPEG standard.

Forgent announced licensing agreements in June with Sony and another "prestigious international consumer and commercial electronics firm." The unnamed company paid \$15 million, according to Forgent's SEC filing for the quarter ending April 30 (the most recent available).

Meanwhile, the JPEG Committee announced plans to launch a Web site demonstrating "prior art," or uses of JPEG before the patent was filed. The patent itself may expire as early as 2004. ▲



Patent holder Forgent Networks is trying to license the heretofore free JPEG format to manufacturers.

Software Shorts

Sometimes all the news simply doesn't fit, but here is a handful of items we squeezed in.

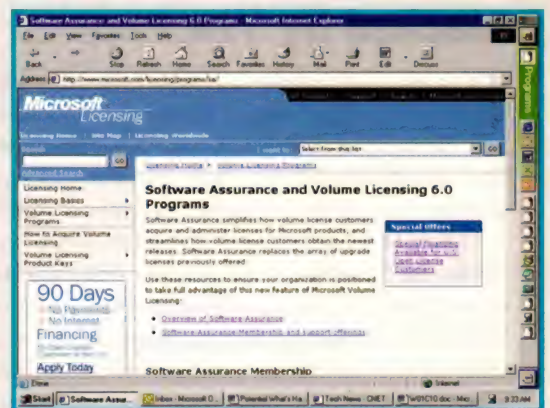
A Chill In San Diego

Mum's the word from Hollywood, as the DMCA (Digital Millennium Copyright Act) continues to chill speech about circumventing copy-protection technologies. In this case, open-source luminary Bruce Perens decided not to defy the DMCA at the O'Reilly Open Source Convention in San Diego. Perens had planned to explain how a DVD player he'd bought had been modified to play DVDs purchased from other regions, such as Europe. However, his employer, HP, reportedly asked him not to do so, citing criminal liability under the DMCA. Because the convention charged admission, Perens' intended speech could have earned him as many as five years in jail and a \$500,000 fine.

Licensing 6.0

Microsoft implemented its new volume licensing program, dubbed Licensing 6.0, on July 31 (www.microsoft.com/licensing). Exact figures are unavailable at this writing, but preliminary reports say a significant number of Microsoft's licensees chose not to sign up for the new scheme. Very simply put, Licensing 6.0 would benefit Microsoft in several ways:

increasing revenues, smoothing out revenues year-to-year, and encouraging licensees to upgrade more often than the typical three-year or longer cycle. Unfortunately, many licensees choosing to stick with Microsoft are left with a choice between increased annual costs and additional work rolling out more frequent upgrades or higher costs to upgrade later on. Analysts expect a surge of interest in low-cost alternatives Linux and StarOffice.



Microsoft's new volume licensing scheme doesn't favor those who don't upgrade every three years or less.

That Sounds OGG

What could be freer than MP3s? A royalty-free, open-source audio compression format, in contrast to the Fraunhofer Institute-licensed MP3 format. In July, the nonprofit Xiph Foundation announced the launch of the long-awaited version 1.0 of Ogg Vorbis, file extension .OGG. It is free for any developer to use in new applications, such as music encoder/players, or artists to use to distribute their music. There's little reason to be dissatisfied with MP3, of course, but Ogg Vorbis has even fewer strings on its use. And, Xiph claims, OGG even sounds better.

Internet . . .

Open Source Or Open Can O' Worms?

RealNetworks announced a new development platform for streaming media, called Helix, in July. The streaming media giant also plans to release the source code to the platform's core Helix DNA Client by late October and the code to Helix's encoder and server components before the end of the year.

The company also released Helix Universal Server, which can stream more than 55 file types, including WMA, QuickTime, MPEG-2 and -4, and Real

formats. Helix Universal Server runs under Windows, Linux, and Unix server OSes. RealNetworks also touts Helix Universal Server's speed and built-in redundancy from the encoder to the client. Later, RealNetworks announced plans to support the new Ogg Vorbis format. (See the "That Sounds OGG" section on page 9 of this article.)

The controversy is whether RealNetworks had Microsoft's blessing to include WMA support on a non-Windows OS. Microsoft's

Windows Digital Media Division lead product manager

Michael Aldridge didn't comment on that but told us, "Real has finally admitted the importance of supporting Windows Media." He added, "Real has swept a little fact under the 'open source' rug: that with Real, you pay for the server and you also pay per stream. Their solution can cost over \$40K while Windows 2000 can cost between \$3K to \$5K per server." ▲

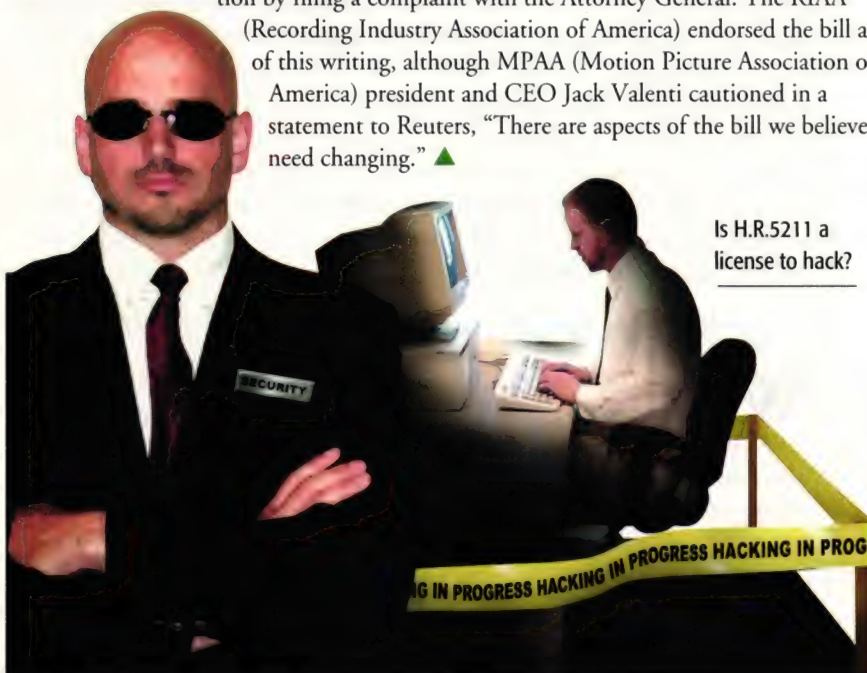
RealNetworks hopes Helix's open-source characteristics will entice developers.

Helix™

Hacked By The Man

It's a time-honored plot in Hollywood movies: The good guys go after the bad guys by using the bad guys' tactics. California Democrat Rep. Howard Berman, along with Rep. Howard Coble (R-N.C.), Rep. Lamar Smith (R-Texas), and Rep. Robert Wexler (D-Fla.), introduced a bill in late July to legalize hacking by copyright owners who suspect someone has acquired an unauthorized copy of their work through a peer-to-peer network.

H.R.5211 would let copyright owners with a "reasonable suspicion" of piracy avoid liability for "disabling . . . or otherwise impairing" the use or distribution of a copyrighted work over P2P, after notifying the Department of Justice at least seven days beforehand. The bill stipulates that the copyright owner cannot alter any other files, affect other users, or damage the storing system more than \$50 per impairment. Anyone hacked by a copyright owner resulting in more than \$250 in damage can seek compensation by filing a complaint with the Attorney General. The RIAA (Recording Industry Association of America) endorsed the bill as of this writing, although MPAA (Motion Picture Association of America) president and CEO Jack Valenti cautioned in a statement to Reuters, "There are aspects of the bill we believe need changing." ▲



Is H.R.5211 a license to hack?

Ivy League Hacking Hijinks

In any typical college shenanigan movie, the designated nerd hacks into the dean's/rival fraternity's/transcript office's computer to play a few nasty pranks. In July, Princeton University admitted some of its employees improperly accessed information on a Yale University system, but the acts seemed more nosy than malicious.

Yale maintains a Web site to let applicants find out if they have been accepted into the school. In July, Yale notified Princeton that it had traced 18 site accesses in April to the Princeton campus, and that 14 of those accesses came from Princeton's Admission Office. Workers in Princeton's admissions apparently checked on 11 applicants to both schools to find out whether Yale had accepted them, using the applicants' names, birth dates, and Social Security numbers. Princeton recently removed Associate Dean and Director of Admission Stephen LeMenager from his post and offered him a new position at the school. LeMenager described his own visit to Yale's site as a test of its security.

In a statement in late July, Princeton president Shirley Tilghman apologized to the applicants involved and described the school's apology to Yale and efforts to correct the situation. ▲

ICANN Director v. ICANN

A legal battle between ICANN (Internet Corporation for Assigned Names and Numbers) and one of its directors, Karl Auerbach, appears to be over at this writing. Auerbach was elected as a director in late 2000, publicly declaring his intent to reform the non-profit organization responsible for assigning Internet domain names and IP addresses. He filed suit in March 2002 in the Superior Court for Los Angeles County,



ICANN
The Internet Corporation for Assigned Names and Numbers

Calif., alleging that ICANN had denied him access to and the right to copy the organization's corporate records, such as financial ledgers and travel logs, since November

2000. The suit claimed that ICANN first asked Auerbach to agree to a policy stating that he could only access records with the approval of and under restrictions set by ICANN's CEO. The policy further said that a director could appeal unsatisfactory restrictions to ICANN's Audit Committee, chairman, or board of directors.

ICANN petitioned the Court to dismiss Auerbach's suit, arguing among other things that the access he sought would give him the power to distribute documents he decided did not merit confidentiality. Judge Dzintra Janavs tentatively ruled in Auerbach's favor July 29, stating that the unofficial document inspection policy violated both California's Corporate Code and ICANN's own bylaws permitting directors all necessary access to records. ▲

New On The 'Net

Looking for some new surfing destinations? Here's a sampling of the many sites that recently hit the Web.

No Nearby Nukes

No matter what you think about the recently approved Yucca Mountain nuclear waste storage site, you certainly don't want any accidents happening to toxic waste shipments near your house.

Check the Environmental Working Group site at www.mapscience.org to find out just how close you live to a probable train or truck route to the site.



WebMasterSpy

We're not about to start any arguments over who made a cooler spy,

Danger Man/The Prisoner Patrick McGoochan or any James Bond star you care to name (cough, McGoochan, cough). We're trying to tell you about the International Spy Museum's new Web site, www.spymuseum.org, launched to coincide with its grand opening in Washington, D.C. The museum boasts the largest collection of real spy artifacts ever publicly assembled. But please, don't pester the staff with your Dr. Evil impressions.

Our workplace is far too close to a probable nuclear waste truck route, should any accidental spills befall. Time for a raise.

We're Where, Exactly?

GPS aggravates people's wanderlust. Whether you're backpacking in unfamiliar territory, calling for roadside assistance through a satellite service, or trying to drop big bombs into tiny little cave openings, GPS is your friend. MightyGPS.com is a new online marketplace claiming to have the lowest prices around on hardware, software, and even maps of various descriptions. It's a good place to steer a friend the next time she complains she needs to "find herself."

BIOS Upgrades Available Online

Before you send another motherboard to the landfill, consider upgrading the BIOS and giving your PC a new outlook on life. Here are a few recently released upgrades. Check out www.smartcomputing.com/cpumag/oct02/bios to see the entire upgrade list.

Manufacturer	File (Date Available)	URL
ECS (Elitegroup)	L4S5M/DX version 1.1k (7/26/2002)	www.ecsusa.com/ecusa/www.ecs.com.tw/download/l4s5m.htm
ECS (Elitegroup)	L4S5MG version 1.1k (7/26/2002)	www.ecsusa.com/ecusa/www.ecs.com.tw/download/l4s5mg.htm
ECS (Elitegroup)	L4S5A PCB 1.X version 1.0k (7/26/2002)	www.ecsusa.com/ecusa/www.ecs.com.tw/download/l4s5a.htm
ECS (Elitegroup)	P4VXASD2 PCB 1.X version 02/06/27 (7/17/2002)	www.ecsusa.com/ecusa/www.ecs.com.tw/download/p4vxasd21x.htm
ECS (Elitegroup)	P4VMM2 PCB 1.X version 02/06/27 (7/16/2002)	www.ecsusa.com/ecusa/www.ecs.com.tw/download/p4vmm2.htm
ECS (Elitegroup)	P4VXASD PCB 1.X version 02/06/27 (7/5/2002)	www.ecsusa.com/ecusa/www.ecs.com.tw/download/p4vxasd1x.htm
ECS (Elitegroup)	P4VXAD PCB 3.X version 1.3 (7/9/2002)	www.ecsusa.com/ecusa/www.ecs.com.tw/download/p4vxad3x.htm
ECS (Elitegroup)	P4VXAS2 PCB 2.0x version 2.1a (7/12/2002)	www.ecsusa.com/ecusa/www.ecs.com.tw/download/p4vxas22x.htm
ECS (Elitegroup)	K7SEM PCB 3.0C version 02/07/26 (8/1/2002)	www.ecsusa.com/ecusa/www.ecs.com.tw/download/k7sem3x.htm
ECS (Elitegroup)	BKS630E PCB 7.X version 7.1m (7/30/2002)	www.ecsusa.com/ecusa/www.ecs.com.tw/download/bks630e7x.htm

Compiled by Steve Smith

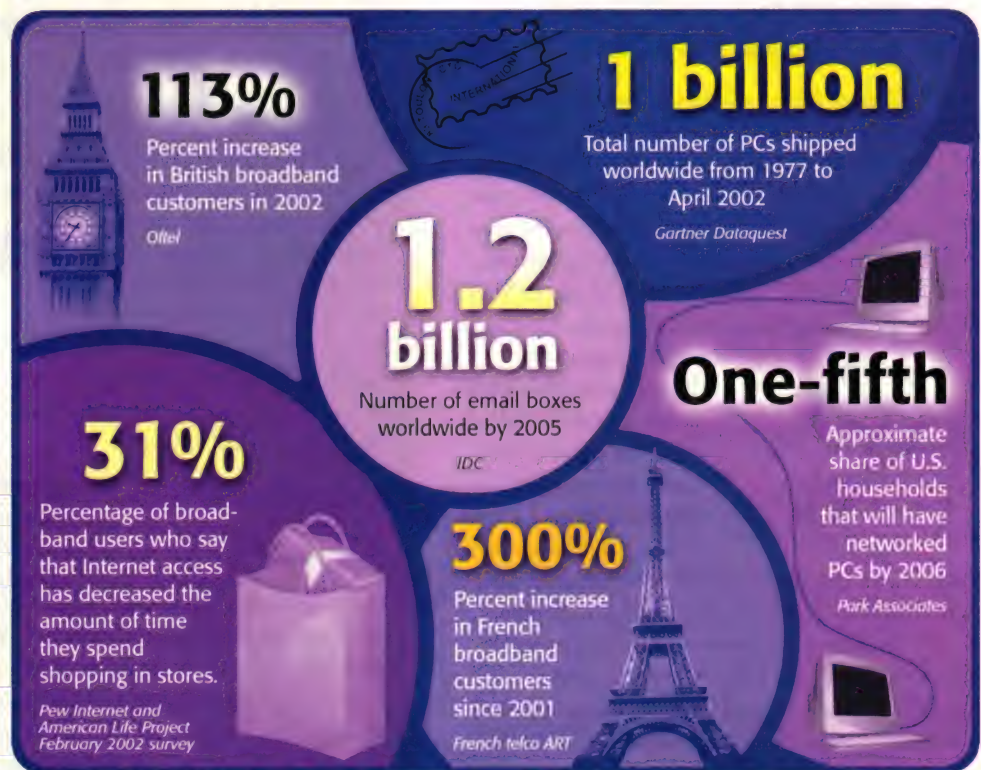
You Get PAID For That?

Senior Software Engineer
WildTangent

Why write databases for some pharmaceutical company that plans to save the planet from viral epidemics? Why write software for defense systems that guard against deadly terrorist attack? In short, why bother saving the world when you could put that Comp Sci degree to work coding ultra-cool online games for WildTangent? Founded by former Microsoft (and current *CPU* columnist) Alex St. John, the company brings full 3D-accelerated DirectX gaming to the Web page via its own Web Driver gaming engine. WildTangent needs a Senior Software Engineer to develop and maintain the tools that build these cool games for the likes of Nike, FoxSports, and Turner Network Television.

Before applying, you'll want to make sure your geek specs are up to snuff. Five years of C/C++ experience? Check. Scripting languages? Check. Experienced with .NET? Well, not really, but who is? Java? Natch. Digital rights management? Check. "Strong written, verbal, and interpersonal skills?" Uh, oh. Well, maybe you'll just have to settle for running gene-splicing simulations for advanced cancer research or something. Rats. ▲

RAW DATA



HORROR IN THE IT WORKPLACE

Better Learn To Hold It

Consultant IT management book author Paul Glen recalls working for a supplier of cell phone switches back in the day. The company was so short of desk space and computers for the staff that it had to run three shifts to keep people from standing without a place to sit or work. "Whenever I would get up to go to the bathroom, I would return to find someone using my computer," says Glen.



OK, Then, How About If I Give A Bit On The Salary?

True story, according to recruiter Bob Silver of Silver and Lee Associates. A job candidate finishes his final interview with the company hiring manager. Terms are finalized, salary and starting date set. The manager stands to shake hands with the new employee and falls dead on the spot of a heart attack.

Think you've got it worse? Share your true workplace horror stories with us at
workwoes@cpumag.com

by Alex St. John

The Future Of Your CPU

CPU, as we all know, stands for central processing unit. Lately, however, the CPU's role in your computer has not been looking so "central." In previous columns I've talked about how the modern PC has become increasingly I/O-bound. It's not much use having a 2GHz CPU when it spends most of its time idle, waiting for data to slowly trickle off your hard drive, broadband connection, or CD-ROM.

Aside from unnecessary software bloat, the actual CPU requirements of most consumer applications other than games have not evolved all that much over time. As I've said in the past, the only applications that really drive demand for more powerful consumer computers are games, but even here a serious bandwidth gap is beginning to show.

A game is an extremely I/O-dependent real-time application. A modern PC video game like EverQuest has to load vast quantities of data off a hard drive while simultaneously mixing dozens of channels of real-time audio and pushing it out to the audio processor, processing a constant stream of mouse/keyboard/joystick/gamepad input, carrying on bidirectional communications with other players on a network, and composing a 3D world and pushing it to the video card for rendering.

Essentially, the CPU spends a lot of its computation time just coordinating the reading and writing of real-time data to dozens of other specialized I/O processors. The CPU's primary contribution to a game, other than moving data around, is usually in three areas: physics, AI, and 3D world management.

The most pressing consumer demand for computing power is in the area of realistic 3D rendering. While the market has run low on consumer uses for a more powerful CPU, the GPU is several orders of magnitude away from providing the real-time 3D visual quality that the human eye has come to expect from "reality." This summer's Nvidia chips will have twice the transistors of a P4 CPU; in other words, the GPU is about to become your computer's "central processor" and the CPU is increasingly relegated to the task of the I/O processor responsible for handling the more trivial task of shuttling data between I/O devices. Interestingly, the computational tasks needed

to create more realistic 3D worlds are not very different from those already performed by the CPU; the problem is bandwidth.

On a PC, the CPU is separated from video memory by the system bus. The system bus creates a tremendous bandwidth chasm between the CPU and GPU. Consider that rendering a high-quality 3D scene at 60fps requires the manipulation of around 2GB of data per second. Your GPU can't fetch data from system memory fast enough even over the fastest AGP bus to achieve that performance. Hence a leading-edge PC GPU needs to pack its own memory, and redundant general

processing capabilities along with it. The CPU once again functions as an I/O processor handing 3D world data across the bus to what is essentially another entire computer, which has fast enough access to its local memory to achieve the performance necessary to create

high-quality real-time 3D scenes. It's a lot of expensive redundant transistors and RAM to make up for the fact that the PC bus is too slow to allow the CPU to help out with 3D rendering.

This problem has an unpleasant side effect on PC stability, as well, because it forces the GPU and DirectX video drivers to be far more complex than they need to be, resulting in a much greater disparity in performance and stability between differing video chips and PC configurations.

Consoles don't have this problem. The PS2, Xbox, and GameCube have shared memory architectures between their CPU and GPU units. This produces blazing speed without the vast quantities of redundant transistors and RAM a PC requires to achieve a similar result. The dual-ported RAM used on these systems also prevents the CPU and GPU from deadlocking on accessing memory at the same time. If Intel wanted to preserve and enhance the role of the CPU as something other than an I/O processor, it would do well to examine ways of moving the PC architecture to a more console-like shared memory architecture between the CPU and GPU. ■

The most pressing consumer demand for computing power is in the area of realistic 3D rendering.

Alex St. John was one of the founding creators of Microsoft's DirectX technology. He is the subject of the book "Renegades Of The Empire" about the creation of DirectX and Chomeffects, an early effort by Microsoft to create a multimedia browser. Today, Alex is president and CEO of WildTangent Inc., a technology company devoted to delivering CD-ROM quality entertainment content over the Web.

*The Saint can be reached at
TheSaint@cpumag.com.*

EXTREME HARDWARE

These Gizmos Don't Sing It, They Bring It

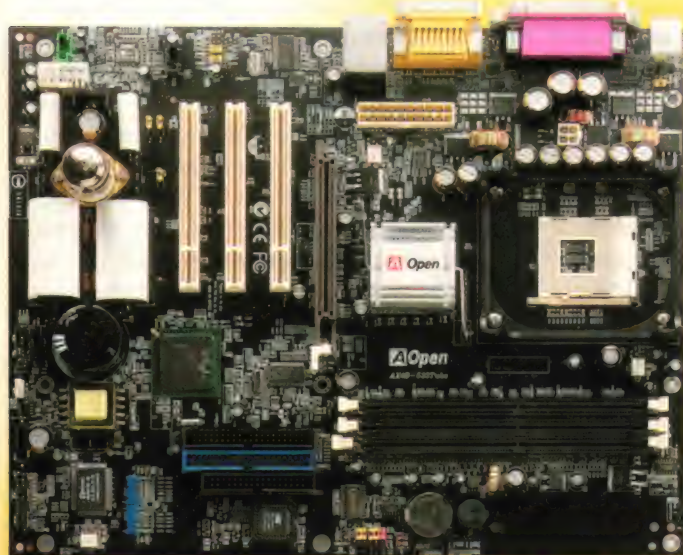
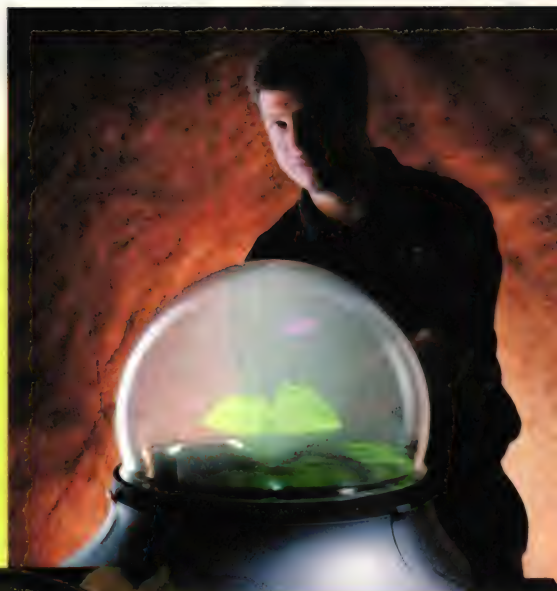
You can see right through us. Our motives are transparent. Clearly, all we want to do is bring you extreme hardware. We looked in our crystal ball and found a 3D monitor in your future. We also foresee you shedding color-

less tears of wonder over the crystal-clear sound of audio through vacuum tubes. And lest ye cast stones at the first sewing machine to run Windows, remember the adage about glass houses.

by Marty Sems

Actuality Systems Perspecta

We can put a man on the moon, but we still don't have 3D monitors shaped like crystal balls? Actually, Actuality Systems (www.actuality-systems.com) does. The Perspecta isn't a holographic display, but it's the next best thing. A spinning screen inside its transparent globe catches light from a digital projector, re-creating data as a 10-inch image appearing to have three dimensions to the naked eye. Actuality's special software crafts 198 different 768 x 768-pixel 2D images of what's on-screen in an arc from front to back, then sends them to the Perspecta via Wide SCSI-2 cable. The Perspecta renders the images internally and then projects them into what looks like thin air. Perspecta currently supports Win2000 and Linux. Although everyone who knows about the Perspecta wants one, the U.S. Army Research Laboratory stepped up first. You can step up yourself for \$45,000, plus a few odd thousand for the SDK, installation, and other minor necessities.



AOpen AX4B-533 Tube

How long has it been since you've let any electronic equipment "warm up"? Solid-state chips and integrated circuits have replaced fragile, expensive vacuum tubes in just about every electronic device. However, many audiophiles and any musician worth his Les Paul are adamant: tubes offer superior tone. AOpen melded the latest with the greatest by placing a Sovtek 6922 vacuum tube audio preamp on its AX4B-533 Tube motherboard. AOpen claims a 5,000 to 6,000-hour life for the replaceable tube and says its heat output is less than the chipset's itself. The i845E-based Pentium 4/DDR board supports a 533MHz front side bus, USB 2.0, and 5.1 channels of pure, smooth sound. Warm up to the Tube for about \$245 online (www.aopen.com). As the kids say: It's totally tubular, dude.



Yamaha CRW-F1

Here's something that's a little freaky deaky, yet potentially pretty useful. It's also the kind of thing that, in retrospect, makes you smack your forehead and go, "Duh! Why didn't I think of that?" Yamaha (www.yamaha.com) made a CD-RW drive that lets you burn visible text or graphics into the unused tracks of a recordable disc. That's the DiscT@2 Laser Labeling System built into the 40X/24X/44X CRW-F1 family (\$179.99; CRW-F1ZE). Ahead worked with Yamaha to build the DiscT@2's labeling interface into a special version of Nero Burning ROM, letting you serialize your corporate backups or personalize your mon-

ster jams. The CRW-F1 comes with SafeBurn and Mt. Rainier support and works with Linux, Mac OS, and Windows. Now, if Yamaha would only add a second burn head for the top of the disc, perhaps branding some unlabeled media suitable for DiscT@2 burning on both sides, stick-on CD labels could be a thing of the past.

Bernina artista 200e

It's Bill Gates' dream: Windows woven into the very fabric of your life. The digital home has arrived, and Microsoft is there to bridge the oft-lamented gap between the PC and the laundry room. Bernina's (www.berninausa.com) artista 200e is the world's first Windows CE-powered sewing machine. You can navigate the millions of things the artista can do on its color touch screen. Next, you can use preloaded stitches and embroidery patterns to embellish the PDA pockets on all your clothes or create and save your own designs. Or, if you're always forgetting crucial facts, you can sew your name on your clothes with cool fonts. Options include a USB CD drive and a PC Card modem for downloading patterns. (We don't pretend to understand all the Bernina site's gobbledygook about bobbins and feed-dogs; apparently the sewing circle spews more jargon than geeks do.) Plop down \$6,898 for all of the above, but don't forget: A ThumbDrive is no substitute for a real thimble. And hey, we want to see someone post a Linux port of this darn(ing) thing so that you can make yourself a penguin suit for the next conference with a clear conscience. "I sewed my own Tux!"



Sennheiser Orpheus

Speaking of better audio through vacuum tubes, it's time to listen to the granddaddy of headphones. Sennheiser's (www.sennheiserusa.com) Orpheus system wouldn't cost \$14,900 if it were a no-talent, solid-state jobby like the ones in the drugstore checkout rack. The Orpheus got *soul*. Using an HEV 90 analog tube amplifier with an onboard DAC, the system has a frequency response of 10Hz to 20,000Hz. It's a few years old, but just think how Medal of Honor Allied Assault or "Star Trek: First Contact" are gonna sound through this baby. If you know anyone who can't rest without owning the best, ruin his day merely by mentioning that the Orpheus exists.





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AND "MUSCLE-BOUND" IN THE SAME SENTENCE.**

Introducing the all-new Chevy Avalanche with its exclusive Midgate.™ The only vehicle that changes from an SUV to

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NVIDIA nForce2

Chipset launches traditionally involve less razzle-dazzle than new GPU announcements but are no less important. NVIDIA's first foray into the chipset market was arguably a torrid affair. Despite relatively good performance

from its nForce (Crush) chipset, an early announcement was dogged by delays to final hardware and expensive final costs. And few of the Taiwanese motherboard manufacturers went with it, opting to go with solutions from VIA. Still, the technology itself and focus upon integration was sound, and a year on, lessons have been learned. With a

foothold inside the door already and still no Pentium 4 bus license, NVIDIA is banking on increasing its Athlon chipset market share this time around with its nForce2.

North. New to the nForce2 IGP (Integrated Graphics Processor; aka Northbridge) is the GeForce4 MX graphics core clocked at 250MHz (same as the GF4MX 420) and support for an external AGP 8X interface. The jury is still out on performance improvements with AGP 8X, but as far as integrated graphics go, the GF4MX raises the bar. To serve the gaming enthusiasts, NVIDIA will also offer a slim-fast version of the nForce2 IGP (sans GF4MX core) dubbed SPP (System Platform Processor). Also new is a second-generation DASP (Dynamic Adaptive Speculative Pre-processor), which acts as a pseudo-AI prefetch logic and should boost benchmark performance.

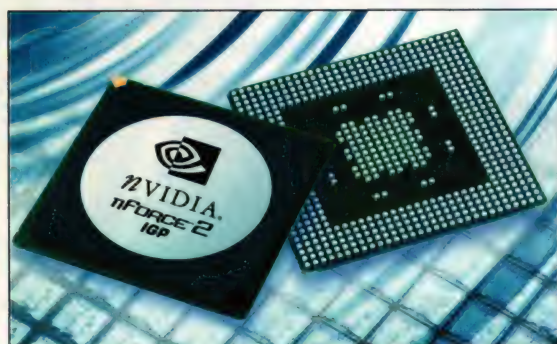
As with the original nForce, NVIDIA has carried over its TwinBank dual-channel DDR memory architecture with support for DDR266, 333, and now 400 modules. When fully armed, 6.4GBps of maximum bandwidth will be possible. But wait, there's less! Athlon XP's 133MHz FSB and 2.1GBps of bandwidth limitations pushes that 6.4GBps number into the "theoretical" department for now.

South. nForce2 OEMs will have a choice of two different MCPs (Media & Communications Processors) when deciding upon the south bridge. The "bare" MCP will be aimed at the value segment with support for USB 2.0, ATA/133, bog-standard AC '97 sound, and NVIDIA's Ethernet MAC (Media Access Controller). The MCP-T will be targeted at the higher end of the scale, with NVIDIA's integrated Dolby Digital capable DSP APU (Audio Processing Unit). NVIDIA's SoundStorm ACR could also be an option to provide the necessary I/Os for Dolby Digital. MCP-T will come with IEEE 1394a support, as well as a 3Com Ethernet MAC. NVIDIA's "DualNet" is an interesting feature allowing for two 10/100 Ethernet ports to be used on a single motherboard: one for a broadband connection and the second as a router providing Internet access across your network.

HyperTransport technology is alive and extremely well and used for linking the nForce IGP/SPP and MCP/MCP-T with 800MBps transfer rates a la the original nForce.

Early doors. It's too early for review samples, but I've been told straight from the NVIDIA labs that performance is best when using DDR266 with the memory bus and FSB running synchronously. The company's in-house testing has revealed upward of a 15% performance delta over VIA's current top performer, the KT333. Boards will be out by late September from the likes of ASUS, MSI, EPoX, and Leadtek. It's important that NVIDIA isn't late for a second time in the chipset arena if it is to loosen VIA's noose over the socket A platform. Clearly with SiS focusing more and more on the P4, and ALi just a passing thought, there is money to be made.

Fish & Chips. nForce2's paper specs look tip-top thus far, but as they say, today's paper often becomes tomorrow's fish and chips wrapper. The really interesting chipset from NVIDIA could be its "CK8" for AMD's Hammer, which is apparently closely related and based upon nForce2. A successful dry run for NVIDIA would certainly pave the way nicely. Then again, that's just my opinion. . . . ▲



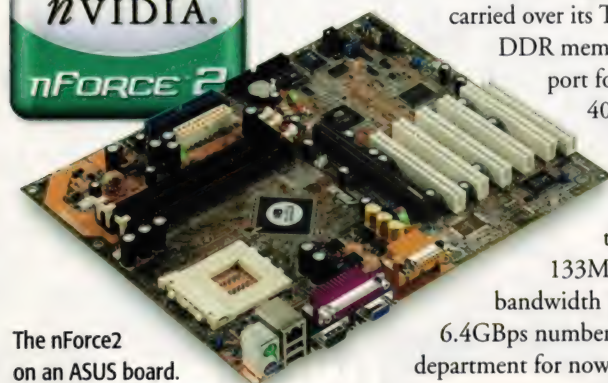
nForce2

Approximately \$150 to \$200 for nForce2-based motherboards
NVIDIA

(408) 486-2000

www.nvidia.com

Preview: No rating



The nForce2
on an ASUS board.

by Alex "Sharky" Ross

SiS R658 Chipset

SiS isn't usually synonymous with the high end. The Taiwanese chipset company generally focuses on value and volume, but a recent announcement of a new Pentium 4 platform at the Rambus Developer Forum in Taipei, Taiwan, could change that picture. The top-end performing P4 platform is currently Intel's i850E chipset coupled with RDRAM. DDR-based platforms are closing in but are still, for the most part, targeted at the mainstream. To be positioned above its 648DX DDR Pentium 4 chipset, the new SiS R658 will support the higher bandwidth RDRAM standard and, for the first time, allow for an "apples to apples" comparison when pitched against the only other RDRAM-based chipset, the i850E. Support for dual-channel RDRAM at 1,066MHz (see page 18 of the September *CPU*) doesn't grow on trees, so read on. . . .

North bridge. Designed for Intel's newer 533MHz FSB Pentium 4, the R658's north bridge will be the first RDRAM-based memory controller that has been validated for the 1,066MHz memory bus speed. (The i850E isn't, but it works with some boards that provide the necessary BIOS tweaks.) Furthermore, overclockers with asynchronous tendencies should be able to dabble with planned memory bus speeds of 1,200MHz and 1,333MHz. With support for as much as 1GB per RIMM module, a maximum of 4GB is a possible configuration for workstation users with a James Cameron-like budget. (i850E is limited to 256MB density RIMM modules.)

The R658 also supports many different speed bins of RDRAMs, which one-ups the i850E's 1066-32 and 800-40 only RDRAM speed bins. The R658 could come in handy for bargain hunters who want to use the lower-cost 1066 and 800MHz speed bins. The flexibility of the new SiS chipset could come into play should motherboard OEMs decide to position products with one or two RDRAM channels, implementing a single RDRAM channel with 16-bit RIMMs or indeed two RDRAM channels with either two 16-bit or one 32-bit RIMM. RAMBUS will certainly hope that the result of such flexibility could lead to an RDRAM chipset actually making its way into other sectors, including the mainstream for the

first time. Hope springs eternal and all that. . . .

Further improvements over the i850E offerings include support for the AGP 3.0 8X standard, which should let owners of next-generation 3D cards take full advantage of the 2.1GBps-worth of AGP bus bandwidth. At least, that's the theory.

South bridge. Paired with the R658 is SiS' new south bridge 963 chipset, which is also far more feature-rich than anything Intel currently offers. The 963 will harbor as many as six USB 2.0/1.1 ports, and the addition of a 1394a OpenHost controller with as many as three ports is quite a treat. The IDE controller allows for ATA/33/66/100, as well as the newer ATA/133 standard. On-board sound is also a feature via 5.1 channel AC'97 2.2 audio.

SiS' proprietary MuTIOL technology will allow the R658 and 963 chipsets a maximum of 1GBps north bridge-to-south bridge frontside bus bandwidth transmission, with a bidirectional, 16-bit data bus and 533MHz operating frequency. Think pseudo-wannabe HyperTransport for a P4 platform, with a couple of hundred MBps extra but nowhere near as widely used or proven in terms of technology.

It all sounds fine and dandy on papyrus, but the jury is still out on just how stable SiS' new package will be and whether any of the first-tier OEMs will announce products based upon it. Benchmark claims from SiS naturally have it ahead of the i850E by anywhere from 3% to 5%, bold claims indeed. However, it's best to take in-house testing with a pinch of salt. So until R658 boards make their way into reviewers' hands, reserve judgment. R658 is already sampling to SiS OEM customers, and mass production is expected in Q4 of 2002, so watch this space. ▲

by Alex "Sharky" Ross



R658 Chipset

Approximately \$150 to \$200 for R658-based motherboards

SiS

886-2-89131168

www.sis.com.tw

Preview: No rating





ATI Radeon 9700 Pro

What is red, DX9-compatible, roughly 7 inches long, and capable of delivering unbeatable frame rates at \$399 a pop? ATI's Radeon 9700 Pro. Shocked? You expected the answer to involve green and NVIDIA, right? The times, they are a changing. . .

also capable of some new goodies such as displacement mapping and flow control with as many as 1,024 instructions per pass. TruForm 2.0 also offers additional tessellation options.

SmoothVision 2.0 is also new to the chip and improves vastly in terms of quality over the first effort, which used supersampling. A new multi-sampling technique has been employed, and full-scene anti-aliasing modes using 2X, 4X, and 6X are possible. With AA and improved anisotropic filtering turned on, ATI's HyperZ III Lossless Z-Buffer compression and Fast Z-Buffer Clear techniques help to make the final result bandwidth and performance friendly. For more info on the technology involved, see the White Paper on page 42 of this issue.

It feels like an eternity since I've been this blown away by a 3D card. Six-month product cycles and rather minimal performance deltas between incoming and outgoing high-end products are responsible for that. But with AA and AF turned on, the 9700 Pro's performance is staggering when compared to the GF4 Ti 4600, which used to be the undisputed champ. So games of today run faster but they look better doing so. As it's fully DX9-capable, you won't need to worry about tomorrow's games, either. On the OpenGL side, as mentioned, Doom III has been shown running on ATI's hardware for a few months now. Id Software's John Carmack has publicly heaped praise upon the technology on numerous occasions. There is no better endorsement than that for hardware running a next-gen 3D game. If you have \$399 to spend on a 3D card, the choice is crystal clear: the 9700 Pro. Right now, there is nothing available that can touch it.

Obviously, the story doesn't end with the R300: Rumors of an imminent die-shrink to 0.13-micron and DDRII could give the chip legs. Although beaten to the punch this time around, NVIDIA's NV30 will hit back with some force. (See page 19 of the September *CPU*.) If history is anything to go by, second place isn't good enough for NVIDIA. The last time that was the case was in early '99 (pre-TNT2 days) when 3dfx was numero uno. It took a lot of hard work by NVIDIA and concurrent fumbling on 3dfx's part to nab the top spot. . . ▲

Radeon 9700 Pro

\$399

ATI

(905) 882-2600

www.ati.com



The 9700 Pro is based upon the R300 chip developed by ATI's Silicon Valley wing, formerly known as ArtX. Manufactured on a 0.15-micron process, the 9700 Pro is rather large, packing 107 to 110+ transistors (ATI's technical specs offer conflicting numbers) in a "flipchip" FC-BGA package. Clocked at 325MHz and with 128MB of 310MHz DDR memory, the R300 uses 256-bit memory with four load-balanced 64-bit memory controllers. As an AGP 8X part, the 9700 Pro does require a floppy drive power connector, as its power requirements edge outside of the AGP 3.0 specification.

ATI has slapped on eight 128-bit floating-point pixel-rendering pipelines, which give the 9700 Pro a significant advantage in the fill rate department. With support for the Pixel Shader 2.0 spec, the board can, in theory, execute as many as 160 pixel shader instructions per pass. As a side note, the R300 includes VideoShader and FullStream technology, which let it run pixel shader programs on video streams, smoothing blocky compression artifacts. The 9700 Pro's four programmable vertex shader pipelines and throughput of 325 million triangles per second make it twice as capable as a GF4 Ti 4600 as far as vertex processing is concerned. Support for the Vertex Shader 2.0 DX9 spec means that it's

Card Comparison

	Radeon 9700 Pro	GeForce4 Ti 4600
Die Size	0.15 micron	0.15 micron
Engine Clock	325MHz	310MHz
AGP	8X	4X
AGP Bandwidth	2GBps	1GBps
Memory Bandwidth	20GBps	10.4GBps
Memory Speed	310MHz	325MHz
Vertex Shader Engines	4	2
Pixel Pipelines	8	4
Textures Per Pass	16	4
Transform Rate	325 million triangles per second	136 million triangles per second
Pixel Fill Rate	2,600 mega-pixels per second	1,200 mega-pixels per second
Anti-Aliased Fill Rate	15.6 billion AA samples per second	4.8 billion AA samples per second

The 9700 Pro's Impressive Debut

Tested on a WinXP Pro P4 2.53GHz

	9700 Pro	GF4 Ti 4600	9700 Pro w/ 4XAA	GF4 Ti 4600w/ 4XAA
3DMark2001 1,024 x 768	14220	12135	10520	6120
Aquamark	45	34	30	13
Quake III	203	143	107	45
Jedi Knight II	123	107	78	32
Unreal Tournament 2003	77	46.5	42	15
Max Payne	84	61	77	28

Benchmarks run at 1,600 x 1,200 x 32 unless otherwise stated

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

by Alex "Sharky" Ross

Sony DRU-120A 2.4X/2.4X/8X DVD+RW

The second generation of DVD+RW drives supports write-once DVD+R media out of the box, an issue that caused manufacturers such as HP a bit of embarrassment with the first gen. Sony is once again a bit ahead of the curve with a slick, speedy burner.

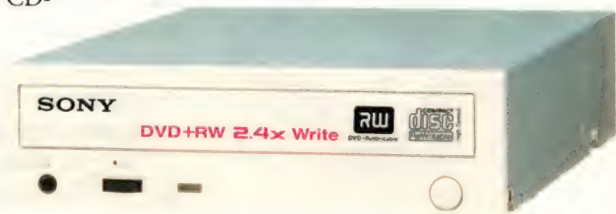
The DRU-120A is a 2.4X/2.4X/8X DVD+RW that doubles as a 12X/10X/32X CD-RW. Of course, it will play regular DVD-ROMs and CD-ROMs, as well, so you're covered on several fronts. Peacenik visionaries go into trances and later awaken droning dreamily of future drives that will support DVD-RW and DVD-RAM, too, but such triple-threat drives are still phantoms at this writing.

This Sony isn't a demon on wheels as a CD-RW, but it takes the checkered flag burning DVDs. We clocked it at 23:30 burning 4GB to DVD+R and 24:03 writing the same folder to DVD+RW. It had an average read rate of 8,007KBps in DVD Tach, and a 10,779KBps maximum. These rates rock. On the CD side,

the DRU-120A made a 700MB CD-R in a humdrum 7:09 and a 639MB CD-RW in 7:07. It averaged 3,520KBps reading in CD Tach, with a 4,701KBps maximum rate. Our test bed had a 1GHz Pentium III, 384MB of SDRAM, and WinXP Pro.

One minor bone of contention is that Sony doesn't throw in any data or audio cables with this \$449.99 drive (grumble, grumble). However, you'll get Dantz Retrospect Express for backups, neoDVD and B's Recorder Gold for DVD writing, CyberLink PowerDVD for movie watchin', and a few other titles. You'll also get a blank DVD+RW, which is nice.

The DRU-120A runs under Win98SE/Me/2000/XP and has a 1-year warranty. It's a drive that does a lot without doing any of it badly. ▲



DRU-120A 2.4X/2.4X/8X DVD+RW

\$449.99

Sony

(800) 352-7669

(408) 432-1600

www.sonymstyle.com



by Marty Sems

Epson Perfection 2400 PHOTO

Epson set out to replace and improve the Perfection 1650 PHOTO scanner with the Perfection 2400 PHOTO scanner. I have two words for Epson: "Well done." Targeting graphic artists and amateur photographers, the 2400 hit the mark.

The scanner setup was quick, simple, and relatively painless. The Perfection 2400 is built to take a decent amount of abuse without breaking and has a sleek, new-age appearance. The software bundle includes Adobe Photoshop Elements and Epson Smart Panel, a typical software bundle for a scanner in this price range.

Epson claims the 2400 scans 60% faster than its predecessor, the 1650, and I was anxious to see if that were true. Scanning at an average rate of 20 seconds at 600dpi, the 2400 lived up to that claim in our tests.

Besides being fast, scans are also well done. Color images had a nice balance of shade and brightness, and details were very clear. Black-and-white images were a bit dark compared to

other scanners in this price range, but this was negligible. Epson included its ColorTrue II Imaging System in the 2400, which seems to give its scans nice color and contrast.

The 2400 was quiet when scanning. In fact, I didn't even know the first scan had been completed because the scanner was so quiet. The 2400 comes with a built-in 35mm filmstrip adapter and can scan to a PDA or a P.I.M. (Print Image Mapping) device, which lets your printer capture the exact specifications of an image, resulting in a better quality print.

Epson has always been a leading manufacturer in the digital market, and the company continues that trend with the Perfection 2400 PHOTO. The scanner looks sleek and well-built, and it performs better than expected for a \$229 scanner. ▲



Perfection 2400 PHOTO

\$229

Epson

(800) 463-7766

(562) 981-3840

www.epson.com



by Mary Lafferty

Palm i705

The i705 is the wireless wonder that Palm's VIIx almost was a couple years ago. Where the VIIx pulled Web clippings and gave you email access, the i705 lets you surf the Internet, manage as many as eight email accounts, and send instant messages, all on a grayscale display.

Once you adjust to the i705's colorless display, you'll notice its antenna at the top replaces the swinging arm on the VIIx. A thin, leather flip cover protects the device's display. Even with its rechargeable batteries, the i705 weighs only 5.9 ounces. It measures 4.65 inches high x 3.06 inches wide x 0.61 inches deep and features 8MB of RAM, 4MB of ROM, and a 33MHz Motorola Dragonball VZ processor.

The i705 lets you download email from your Palm.net account, any POP3 or IMAP account, or a Web email service such as Hotmail. You can download entire email messages or just the subjects, which saves storage space and shortens your download time. You can also use AIM to send messages to contacts.

Whereas the VIIx used PQAs (Palm Query Applications) to deliver clippings from specific sites, the i705 has true access to the Internet. It clips information from sites that will let it do so; it also downloads sites that don't use Web clipping.

You'll need a Palm.net account to use the i705's wireless features. Plans range from \$19.99 a month to \$39.99 a month for unlimited access. Visit Palm.net to see if coverage is provided for your area and to find out how strong the i705's reception is in area buildings. Palm promised excellent reception in my area, indoors and out, and that's what I got.

Users that need the i705's mobility will be using it in a variety of different lighting environments and would appreciate a clear, color display, but it seemed that the screen on my i705 test unit was the device's only major shortcoming. The i705 provides the mobile wireless connectivity you need (or want to need) in a PDA. ▲

by Joshua Gulick

Sharp Zaurus SL-5500

Sharp opens its new line of PDAs with the multitasking SL-5500. It sports a tightly designed exterior and runs Linux, but it doesn't stray too far from the rest of the PDA pack, as it's compatible with Windows.

The Zaurus hides a QWERTY keyboard underneath the seven-button panel just below the display. The buttons provide shortcuts to some standard PIM applications and surround a silver directional pad. The panel, which you slide down to expose the keyboard, protects the tiny keys when you aren't using them, keeping the PDA at a pocketable 5.4 inches high x 2.9 inches wide x 0.7 inches deep. Although the keys are too slippery to hunt and peck with a stylus, they are far enough apart that you can type with your finger.

The SL-5500 uses handwriting recognition for stylus users. If you have sloppy handwriting, you can rely on the Zaurus to adapt, or you can take some lessons from an included training program that walks you through your ABCs.

Sharp combines the Linux OS with a 206MHz StrongARM processor and 64MB of

RAM (expandable via the Secure Digital and CompactFlash slots) for a system capable of handling video (MPEG-1) and MP3 playback. The intuitive Linux OS won't trouble former Windows CE or Palm OS users, and the open-source code paves the way for programmers to create new applications.

The SL-5500's software package includes applications for viewing presentations, recording voice messages (you'll need a headset with a microphone to dictate and listen to recordings), and enough games to get you through a wait at the dentist's office.

The spreadsheet and word processor applications are compatible with Microsoft Excel and Word, and the email software synchronizes with Microsoft Outlook on your PC. If you buy a compatible modem, you can use the email software to send and receive email messages wirelessly. The Zaurus SL-5500 is pricey at \$449, but it delivers on its multimedia promise. ▲

by Joshua Gulick



i705

\$399

Palm

(800) 881-7256

(847) 262-7256

www.palm.com



Zaurus SL-5500

\$449

Sharp

(800) 237-4277

(201) 529-8200

www.sharppusa.com

HP dvd200e 2.4X/2.4X/8X DVD+RW

Here's a smart-looking external DVD+RW I'd love to have on my desk. It gives up a good deal of speed compared to the similar internal Sony DRU-120A, but HP makes up for it with the dvd200e's complete package.

Like the EIDE Sony, HP's dvd200e is a 2.4X/2.4X/8X DVD+RW, as well as a 12X/10X/32X CD-RW. Yes, it does DVD+R... why do you ask? Wink, wink. The dvd200e may not be cosmopolitan enough to support DVD-RW or DVD-RAM formats (no drive supports all three rewritable DVD formats at this writing), but it's bilingual on the interface front with both FireWire and USB 2.0 support.

The drive weighs just 2.7 pounds or about 3.5 pounds with its power adapter and cables. Much of the weight in the box the dvd200e comes in is in the thick users manual, support booklet, and quick start poster.

Speaking of cables, hats off to HP for including not only USB 2.0 and FireWire cables, but also a stereo audio cable. The audio cable connects to a line-out jack in the unit's rear, right next to the sliding panel that hides either the USB port or FireWire jacks. There's a separate headphone jack and volume control on the front of the drive.

Using its USB 2.0 port, we tested the dvd200e with a 1GHz PIII WinXP Pro system with 384MB of SDRAM. As expected, its DVD burning times looked more impressive than its CD-RW portfolio, with a 33:54 time to finish writing 4GB to DVD+R and 33:15 doing the same to DVD+RW. The dvd200e took 10:37 to write a full 700MB CD-R and 11:25 to burn 639MB to a CD-RW.

In short, the dvd200e is highly stylish and extremely useful. Pricey, though. ▲

by Marty Sems



dvd200e 2.4X/2.4X/8X DVD+RW

\$549.99

HP

(800) 752-0900

(888) 999-4747

www.hp.com



Sony GDM-FW900

Remember back in the '70s when television sets were colossal things in wooden cabinets that rested on four legs on the floor? Well, take a look at Sony's contender for the most colossal monitor award: The GDM-FW900 wide-screen CRT display. This thing weighs 92.6 pounds! It has a 22.5-inch screen, measured the good old-fashioned diagonal way, but its miniaturized Cinema-scope look warrants my explaining that the screen measures approximately 19 inches horizontally and 12 inches vertically. That's a 16:10 aspect ratio, boys and girls. Can you say "power trip"?

The screen is beautifully flat, which is one of Sony's top marketing points for the GDM-FW900. The monitor's enormous screen size and maximum 2,304 x 1,440 resolution make a killer combination that gamers, graphic designers, publishers, and mega-multitaskers will appreciate. Which brings me to a good point: At two grand, this monitor is priced for the pros. Sure, the monitor is great for viewing DVD movies;

but with digital projectors declining in price (albeit slowly) and LCD screens getting bigger, I'm not sure how many home theater maniacs would go the huge-CRT route (too many bad '70s memories to contend with).

The monitor has a 0.23mm to 0.27mm variable dot pitch, user-friendly controls, and a nifty four-port USB hub built into the base. And despite its potential for throwing out your back when lifting it, it takes extremely little effort to adjust.

In testing, the GDM-FW900 provided the sharpest detail I've ever seen in a CRT, and it balanced light and dark brilliantly. Its only drawback is that it doesn't excite colors enough to make them leap off the screen. However, all the color scales were perfectly balanced, and the monitor handled the high-resolution photos beautifully. In all, if you want real estate and precision, the GDM-FW900 is close to ideal. ▲

by Cal Clinchard



GDM-FW900

\$1,999

Sony Electronics

(800) 571-7669

(201) 930-1000

www.sony.com/displays



**C-Pen 800C**

\$129.99

C Technologies

(877) 275-2736

www.cpen.com



C Technologies C-Pen 800C

After reviewing the C Tech C-Pen 10, I wasn't expecting too much from the C Tech C-Pen 800C.

However, I was pleasantly surprised.

The 800C offers a lot more options and at \$129, only costs \$30 more.

I had a few troubles initially getting the 800C to work. Unlike the C-Pen 10, you need to charge the 800C before using it. I had a few problems getting the pen to detect the charger, but it eventually worked.

The 800C reminded me of a mini PDA. With icons for Notes, Address, Calendar, Dictionary, Message, Settings, Info, Storage, Direct, Beam, and Write, this pen is loaded.

You can use the Dictionary to look up definitions or as a translator, depending on which of the 36 dictionaries C-Tech offers that you decide to download. The first dictionary is free; each additional one will set you back about \$40. However, two dictionaries may not be an option, considering

that each dictionary is between 2MB and 4MB in size and the 800C has about 4.4MB of free space.

The Direct icon lets you scan lines directly into a program on your computer, or you can download the information later on your computer, PDA, or cell phone using the Beam icon. I had some trouble getting the practice scan lines in the users manual to scan. When I did get scans to work, about every tenth letter was wrong. In addition, punctuation was consistently incorrect.

The 800C definitely has problems scanning correctly, like any digital pen does, but the diversity of features puts this pen above the rest. The small size makes it a nice pocket companion, and the benefit of not keeping track of a stylus is nice, not to mention that the pen stays charged for three weeks at a time. ▲

by Mary Lafferty

Panasonic SV-AV10

**SV-AV10**

\$450

Panasonic

(800) 211-7262

www.panasonic.com



Do-everything digicams smack of gadgetry, not photography. Because of this, I've always been wary of such products—gadgetry for show never impresses me.

Multifunction cameras such as Panasonic's SV-AV10, however, are slowly changing my mind.

This camera, if you can call it that, captures still images, full-motion video, and audio and also plays MP3s. If you think that sounds impressive, you're right, especially considering the SV-AV10's size. It's seriously palm-sized and extremely lightweight. The lack of heft, however, proves to be part of this camera's downfall. An insubstantial plastic case is simply insufficient for a camera with a street price near \$400.

The VGA CMOS sensor is seriously weak, too. Still shots will look suitable for email purposes only; forget hardcopy prints. Sadly, video quality is lacking, as well. A slow frame rate will make your subjects look blurry, and I noticed

that sometimes the accompanying audio seems out of synch with on-screen action.

The mic, however, is decent for recording audio clips, and you can store hours and hours of such material on the included 64MB SD card. On the flip side, you won't squeeze more than a few MP3 files on this one.

Still, Panasonic gave this camera some nice touches. The foldout, twistable LCD monitor is sweet and adds a DV camcorder feel. The rechargeable lithium-ion battery has a bit of muscle, but the fact that you can't swap in a recharged cell is a bit of a pain. The on-screen menus are generally clear, colorful, and intuitive, but you'll have to do too much digging to perform simple functions, such as deleting individual files.

For 100 bucks less than its current street price, the SV-AV10 would be a nice addition to your store of gizmos. At well more than \$300, however, this digicam has the feel of an overpriced toy. ▲

by Nathan Chandler

Argus DC-3300

You've seen lots of "wondrous" multifunction cameras on display at Target lately. But once you actually get your hands on these devices, all you wonder is what these companies were thinking when they dreamed up these devices. The Argus DC-3300 falls into this unfortunate category.

This \$200 device takes still pictures and records video and sound clips. It comes with a 1.3MP CCD, a "focusable" lens, and 3X digital zoom that I'll be taunting in a moment. The DC-3300 stores data to its 32MB internal flash memory or a SmartMedia card of your choice. Power works via four AAA batteries, which are not included, so plan on buying plenty to power the 1.5-inch TFT monitor and accommodate the super-slow USB image transfers.

Still pictures leave a lot to be desired. Indoors, I saw a lot of yellowing, and minus a flash, it was exceptionally easy to blur shots in sparse ambient light. In bright outdoor

light, most shots looked overexposed, and all shots had unpleasant discoloration, with dingy, Dali-esque hues.

As for the other functions, the microphone works pretty well, and you can record up to four hours of sound. The video system lets you capture clips up to three minutes in length, but the results are choppy and blurry.

In spite of all this, my main complaints are with the control system. The "focusable" lens is rather laughable; you rotate a dial on the side of the camera to switch from Landscape to Macro mode. To use the digital zoom, you have to hold a button for three seconds. Let up too soon, and you'll simply switch from still to video mode. Add in the fact that the whole gizmo looks and feels like it's made from cheap plastic, and you start to realize that \$200 is too much to ask. ▲

by Nathan Chandler



DC-3300

\$200

Argus

(888) 552-7487

(847) 228-5300

www.arguscamera.com



Samsung ML-1430

In fall 2001, several manufacturers introduced new laser printers at rock-bottom prices. As you might expect, many of these sub-\$300 lasers suffered from bad print quality. The Samsung ML-1430 costs less than those lasers, yet has better printer quality, suggesting that we're moving into the second generation of low-cost lasers.

The ML-1430 has a 66MHz RISC processor and 8MB of RAM. You won't find extras such as PostScript fonts, duplexing, or network capabilities, but if you need a laser for home printing, this small, 13.7-pound Samsung printer should meet your needs.

The printer has a paper capacity of 150 sheets and supports both parallel and USB interfaces. In our tests, the printer came close to matching Samsung's listed 15ppm speed. A 10-page text file, printed at 300dpi, displayed a rate of 13.7ppm. A six-page text-and-graphics file and a three-page PowerPoint file had print speeds of 10.0ppm and 12.3ppm, respectively. In all three tests, the ML-1430 produced the first page in less than 0:07 (minutes:seconds).

Even a high-resolution graphic printed at a decent 8.8ppm.

Although, like the low-end laser printers before it, the ML-1430 has problems with crosshatched grays, it excels in two areas. First, even at the lowest resolution setting, the ML-1430 manages text well. In the past, low-end lasers have produced economy-quality text with jagged edges. Second, this printer doesn't have the problems with banding, cuts, or excessive graininess in high-resolution images that plagued other low-cost lasers. Don't get me wrong. This is still a low-end laser, and you won't get stellar high-resolution image prints from the ML-1430, but the image quality is more than acceptable for a \$199 laser.

Like most low-priced lasers, this isn't the right printer for someone who needs high-quality images. However, the average user will find this printer's capabilities and price more than acceptable. ▲

by Kylee Dickey



ML-1430

\$199

Samsung

(800) 726-7864

(201) 229-4000

www.samsungusa.com



CyberPower Titanium Gamer Force Pro



Titanium Gamer Force Pro

\$1,699

CyberPower

(800) 707-0393

www.cyberpowerinc.com



Check out CyberPower's Web site and you'll find a slew of built-to-order systems with a vast assortment of case designs and colors. The system CyberPower sent me for review was a Titanium Gamer Force Pro with a slight variation or two compared with the standard options listed on its site.

Specifications. The centerpiece of the Gamer Force Pro is a VIA KT266A motherboard with an AMD Athlon XP 2200+ processor, which has a 1.8GHz clock speed and is comparable to a 2.2GHz Pentium 4. It has a 266MHz FSB, 128KB of L1 cache, and a sweet 1GB of DDR memory.

The system has some wicked storage and removable media devices, including two 120GB IBM Deskstar hard drives combined in a stripe configuration for 230GB of actual storage capacity. The system also has a top-of-the-line Plextor CD-RW drive, the PX-W4012A; it burns at 40X, rewrites at 12X, and reads at 40X. There's no DVD-recordable action in this system, but there is an Artec 16X DVD-ROM drive.

For multimedia, there's a powerful NVIDIA GeForce4 Ti 4600 video card with 128MB of DDR memory, a Creative SB Audigy 5.1 sound card, and a five-piece Creative Labs Inspire speaker set that features 5.1-channel Dolby Surround Sound. There's also a sharp 19-inch ViewSonic's E90fb monitor with an 18-inch viewable screen, a super-low 0.21mm horizontal dot pitch, and a maximum 1,600 x 1,200 resolution with a maximum 68Hz refresh rate.

The system comes with a Creative Labs 56Kbps fax modem and a D-Link DGE-500T Gigabit Ethernet adapter, a tri-speed 10/100/1000Mbps model. The Mitsuko keyboard and mouse combo includes a multimedia keyboard with Internet, audio, and power management hot buttons, and a roller-ball mouse with scroll wheel. The system has a nice port assortment: one parallel, two serial, five USB (all in back; three are USB 2.0), and one FireWire.

The software bundle covers all the basics: WinXP Professional Edition, Roxio's Easy CD

Creator 5, CyberLink's PowerDVD, MSI's DVD 5.1, Norton's AntiVirus 2002, and Corel's WordPerfect 2002, among others.

Design. Inside the ATX case there's ample elbow room for tweaking and upgrading, and a side window lets you enjoy an inside view. There's also a neon light inside that's completely programmable, so you can have it on constantly or set it to respond to internal or external stimuli, such as hard drive activity or noise. The case is pretty cool; the one I looked at was metallic green, but it comes in any of six metallic colors, including white, silver, black, blue, and green.

The preinstalled 1GB of DDR takes up one slot on the motherboard, so there's room for up to 3GB. Of five total PCI slots, two are available, but the USB card covers one of them. There are six 3.5-inch drive bays, three of which are available, and there are four 5.25-inch bays, two available.

Performance. I could run at the mouth about how well the Gamer Force Pro performed, but suffice it to say that DVD movies played flawlessly, audio CDs with the volume turned up proved the audio card and speakers immensely powerful, and playing Quake III was a blast.

The system earned decent SYSmark2002 scores: 230 in Internet Content Creation and 143 in Office Productivity for a total score of 181. PCMark2002 scores were also good: 5,372 CPU Score, 3,394 Memory Score, and 1,078 Hard Drive Score.

The 3DMark2001 score was a monumental 11,226. No wonder Quake III played well. Running Quake III Arena Demo 1, the system's video card churned out a 212.3fps frame rate at 800 x 600, 204.1fps at 1,024 x 768, and 149.5fps at 1,600 x 1,200.

Final word. I enjoyed the Gamer Force Pro for its top-of-the-line Athlon CPU, huge-capacity hard drive set, gorgeous monitor, and high upgrade ability. But I loved it because of its price tag. If you don't like this configuration, check out others on the CyberPower site. I don't know a great deal about the company, but word of mouth is good. And at prices like this one, you'll find a lot of high-performance bargains. ▲

by Cal Clinchard

Features

Processor:

AMD Athlon XP 2200+

RAM:

1GB DDR

Hard Drive:

230GB

Optical Drive:

CD-RW;
DVD-ROM

Connectivity:

Modem;
Ethernet

Chassis:

Midtower

Monitor:

19 inch

System Use:

Entertainment

Final Word:

Great utilitarian system for cheap.

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Apple iBook 700MHz G3

Apple's PowerBook is an outstanding notebook, especially for Apple aficionados, but for those on a budget, PowerBooks are likely to perpetually remain on the "wish list." Apple's iBook, on the other hand, combines some of the PowerBook's same style but with a more reasonable price tag.

Specifications. The iBook is certainly a step down from the PowerBook in terms of hardware. Instead of a speedy G4 processor, the iBook relies on the older G3 processor. Our iBook test unit included a 700MHz G3 processor, the fastest available at the time. The G3's clock speed is only 100MHz less than the G4, but it's missing a handful of extras. The G3, for instance, doesn't have the 1MB of L3 cache the G4 does. The iBook also operates on a slightly slower front-side bus at 100MHz compared to the PowerBook's 133MHz. The iBook I received included 256MB of SDRAM (upgradeable to 640MB).

The iBook's video card also is a bit scaled-back. The 2X AGP Mobility Radeon features just 16MB of video memory compared to the PowerBook's 4X AGP ATI Mobility Radeon 7500 with 32MB. The iBook is also missing the PowerBook's wide-screen display, and the iBook's display resolution is a bit lower. The iBook comes with a 12.1-inch TFT or 14.1-inch TFT display.

The iBook's 30GB hard drive is reasonable. If you custom order an iBook from Apple, you can opt for a 40GB drive instead. Our unit included a DVD/CD-RW combo drive, but a standard CD-ROM drive is available if you're looking to save a little cash.

Our unit also came AirPort-ready, meaning you can purchase an Apple AirPort card (\$99) and load it into the AirPort slot for wireless networking. Of course, a prerequisite modem is included, as is 10/100 Ethernet (no Gigabit Ethernet as with the PowerBook).

Design. Anyone remember the ugly original iBooks? Apple obviously does, and we're all better off for it. Our iBook featured a clean but elegant design. The white polycarbonate-plastic case seemed strong enough to survive dorm life, but I question the color. Two days in my old dorm and the iBook would've looked more gray than white.

The keyboard's white, opaque keys were comfortable to type with. I did find myself

wishing the ENTER and BACKSPACE keys were just a little bigger, though.

The iBook's display isn't quite as good as the PowerBook's, but it still looks good. The 14.1-inch screen is about the smallest you'll find in a notebook more than 5 pounds.

The 1,024 x 768 resolution is the lowest you'll find in notebooks today and is common among sub-\$2,000 notebooks.

DVD video on this iBook looked a bit grainy, but it wasn't bad. The color seemed a bit warmer than usual, but it was easy to correct using Apple's display settings. The DVD/CD-RW combo drive played back DVD without any difficulty, and the sound was typical of a notebook.

The iBook runs Mac OS X, which is an extremely sharp-looking and configurable OS based on a variation of Unix. This provides OS X with the stability and security of Unix, plus the usability you would expect from a Macintosh. One downfall is that OS X is not strictly compatible with OS 9. The version of QuickTime included with the iBook, for instance, must run a special version of OS 9 within OS X, lengthening the time it takes to load QuickTime. As OS X becomes the standard for new applications, you should find yourself needing OS 9 less and less.

Performance. Unfortunately, I'm writing a Mac review in a PC world, and our benchmarks are geared toward that world. That means we didn't have benchmarks to run on the iBook to let us compare it with its PC competitors. I will say that I didn't notice performance being an issue when using the iBook.

Final word. Apple is targeting the iBook at college campuses and to users on a fixed income. The iBook would certainly make a fantastic notebook for school. It's relatively thin and light but maintains enough flexibility to be useful. Similar models to this review unit cost \$1,799, but you can get your hands on a scaled-down iBook for as little as \$1,199. ▲



Apple iBook

\$1,799

Apple

(800) 538-9696

(408) 996-1010

www.apple.com

.....
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Features

Processor:
700MHz G3

RAM:
256MB/640MB

Display:
14.1-inch
XGA TFT

**Dimensions
(inches):**
13.5 x 12.7
x 10.2

**Weight
(pounds):** 5.9

Hard Drive: 30GB

Optical Drive: DVD/
CD-RW Combo

Connectivity: Modem;
Ethernet

Final Word: Clean,
attractive design and a
reasonable price.

by Chad Denton

Dell Dimension 4500



Dimension 4500

\$1,379

Dell

(888) 799-3355

(512) 338-4400

www.dell.com



Features

Processor:
Pentium 4
2.26GHz

RAM:
256MB
DDR-SDRAM

Hard Drive:
40GB

Optical Drive:
CD-RW/
DVD-ROM

Connectivity:
Modem

Chassis Type: Midtower

System Use: Personal

Final Word: The right
setup for the right price.

The Dimension 4500 from Dell is definitely a system you should consider if you're in the market for a PC.

The 4500 is part of a series of systems that lets you configure just the PC you want, with several options for each system component. Here's a look

at the configuration Dell

put together for me to review.

Specifications. The Dimension 4500 I looked at has a 2.26GHz Pentium 4 processor with a 533MHz bus speed. The memory totaled 256MB of DDR-SDRAM, but you can add as much as 1GB of memory. The Western Digital Caviar (WD400BB-75CLB0) hard drive holds up to 40GB of data, which is a reasonable size yet isn't a huge capacity for the price, especially when you consider that the \$699 (after a \$75 rebate) eMachines T4170 comes with a 60GB hard drive.

One of the exciting things about this Dimension 4500 configuration is the Samsung CD-RW/DVD-ROM drive. The CD-RW has write, rewrite, and read speeds of 32X/10X/32X respectively, and the DVD-ROM has a speed of 16X. You'll also be able to blaze through the Internet at high-speed with the CNET Pro 200 WL PCI Fast Ethernet card. If, however, you're unable to access broadband service, Dell also includes a 56K Lucent WinModem.

And for the three essential pieces of hardware that are sometimes overlooked, this configuration came with a 17-inch Dell (M782) CRT monitor, a Dell Enhanced Performance USB multimedia keyboard, and Microsoft IntelliMouse. As for software, the system comes loaded with Windows XP Home and other software titles such as MS Office Works Suite 2002, MusicMatch Jukebox, PowerDVD, and Easy CD Creator.

Design. The Dimension 4500 case is a mid-tower design with a unique twist. Instead of one side panel coming off so that you can get inside, there are push button release levers on the top and bottom. When you push these buttons, the

case splits open with one side swinging out with everything still together. Think of a book and how the binding keeps the pages together; it's almost like the case has hinges, and when you open the case it opens like a book. One look and you'll see that it's easy to get to everything, but you'll need a lot of desk space to open the case up wide enough.

As for slots, ports, and bays, the Dimension 4500 has four PCI slots (one available), one available AGP slot, one serial port, one parallel port, six USB ports, five 3.5-inch bays (three available), and two 5.25-inch bays (one available).

Performance. The Dimension 4500 produced an overall SYSmark2002 rating of 212 with a 294 for Internet Content Creation and a 153 for Office Productivity. Translation: This machine is just what you need for multitasking between office work, game play, burning CDs, and watching DVDs.

We also ran the 3DMark2001 benchmark, and the system scored 9,490. That's great considering that type of score is normally achieved by systems in the more-than-\$2,000 range. The 64MB NVIDIA GeForce4 Ti4200 graphics card made playing Quake III a great way to spend the afternoon.

By no means did I waste the afternoon playing games; I also put the speakers to the test. The three-piece Harmon Kardon (HK395) speaker system includes two satellites and a subwoofer that lets you control the treble and volume. The sound quality from the speakers and the Creative Labs sound card was very good.

My last task was to watch my "Armageddon" DVD. I had to skip through most of the movie to get to my favorite part; I just love the end when most everyone gets back safe and people are running into each other's arms. Chapter skipping was smooth, and the sound was good.

Final word. The Dimension 4500 configuration I looked at is priced at \$1,379, and let me say, you're getting more than what you pay for. The only things I'd change if buying this system for myself are the size of the hard drive and the design of the case. Otherwise, I'd be hard-pressed to find a better setup for the price. ▲

by Dana Montey

Plextor PlexCombo 20/10/40-12A

Combo drives, which typically add support for some DVD formats to CD-RW mechanisms, are creeping near interesting prices and performance levels. While rewriteable DVD drives are still priced fairly high, DVD-ROM/CD-RW combo drives are starting to look viable for many users. Even if you eschew watching “feelm” on your computer monitor, there’s always the spectre of huge game titles joining the thin ranks of, well, Encarta on the DVD-ROM format. You could skip the extra weight and heat of a separate DVD drive with a combo and still burn CDs at moderate speeds.

At least that’s what Plextor is hoping you’ll think when you see its PlexCombo 20/10/40-12A on the store shelf. The drive is a 20X/10X/40X CD-RW and a 12X DVD-ROM with unlimited, toll-free tech support and Burn-Proof. Plextor admitted this drive and others in its stable have known issues with both DVD Tach and CD Tach, so I’ll skip

the weird benchmarking results we got.

The 20/10/40-12A burned a full 700MB CD-R in 5:38 under WinXP Pro (3:57 for 427MB), and a 639MB folder to CD-RW in 8:02 (5:39 for 427MB). And my usual watchability test—flipping to various favorite scenes in “The Matrix”—went smoothly.

OK, I’d be failing in my duties if I didn’t point out that you can buy an AOpen 24X/10X/40X CD-RW drive and a separate ASUS 16X DVD-ROM online for about \$116 altogether, plus shipping. Note that I haven’t reviewed those units personally, and only you can decide if straying from the proven Plextor brand is worth it to you. The PlexCombo 20/10/40-12A simply offers much of the disc compatibility and speed you need in a single, quality package. ▲

by Marty Sems



PlexCombo 20/10/40-12A

\$215

Plextor

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(510) 440-2000

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Samsung SM-332 Combo 32X/10X/40X CD-RW 12X DVD-ROM

What does Samsung bring to the CD-RW/DVD-ROM combo drive party? High speeds and a low price. The SM-332 does CD-RW at 32X/10X/40X speeds and reads DVD titles at 12X. The drive also packs an 8MB buffer to keep data flowing like quicksilver.

We timed some CD writing sessions on the Samsung by installing it in a 1GHz P-III system with 384MB of SDRAM and WinXP Pro. As I expected, this 32X Samsung whipped several big-name 40X CD-RWs, just like its noncombo 32X forerunner. A 700MB burn to CD-R took just 4:02, which is only about a minute shy of the hottest drive I’ve seen to date. This isn’t a bad CD-RW writer, either, charting an 8:05 time to burn a 639MB folder. Its partial-disc 427MB burn times to CD-R and CD-RW took just 2:52 and 5:41, respectively.

Under CD Tach, this combo drive looked like a reasonably fast reader with a 4,332KBps average rate (5,791KBps maximum). DVD

Tach returned varying results for the SM-332’s DVD reading ability, averaging 9,533KBps and maxing out at 12,482 after five averaged passes.

However, the SM-332 twice broke on through to a maximum read rate near 15,877KBps. We’ve noticed enough issues with both CD Tach and DVD Tach under WinXP to treat all results with some skepticism, but at least we know that this Samsung can hit read rates near its 12X rating.

The SM-332 comes with a printed users guide, an ATA/33 cable, and an audio cable, in addition to blank sample discs. It has buffer underrun protection and a 1-year warranty. I didn’t find the warranty info anywhere in my review unit’s packaging, though, so try using the (800) tech number listed here. ▲

by Marty Sems



SM-332 Combo 32X/10X/40X CD-RW 12X DVD-ROM

\$149

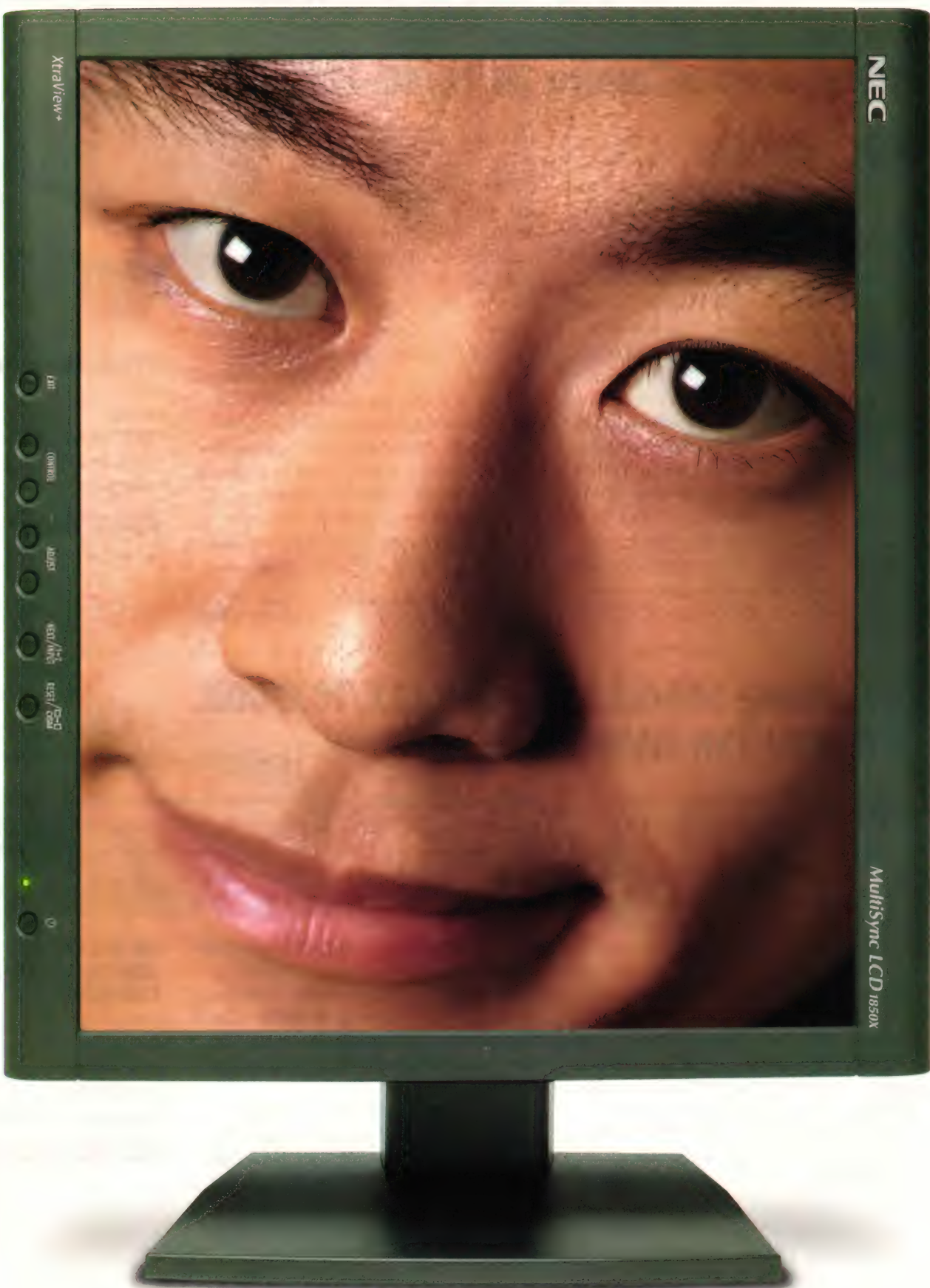
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Trident XP4: A \$99 GeForce4?



Anand Lal Shimpi has turned a fledgling personal page on GeoCities.com into one of the world's most visited and trusted PC hardware sites. Anand started his site in 1997 at just 14 years old and has since been featured in USA Today, CBS' 48 Hours and Fortune. His site—www.anandtech.com—receives more than 55 million page views and is read by more than 2 million readers per month.

I've written numerous times this year about graphics companies trying to make a comeback after a multiyear hiatus. This month I'm adding another name to the list of companies looking to change the face of graphics: Trident.

Trident has been providing graphics for PCs long before NVIDIA became a household name. Although they've never been known for having the most powerful solutions on the planet, Trident has always been able to deliver incredible volumes of their chips. The bottom line is that the majority of PC users still don't have very high system requirements, and Trident's graphics solutions always delivered basic graphics functionality at incredibly low costs: music to the ears of OEMs and System Integrators. But with the 3D revolution well underway, Trident had yet to produce a competitive 3D solution. Until now.

Enter the Trident XP4. The XP4 is a DirectX 8.1-compliant GPU weighing in at 30 million transistors and manufactured on UMC's 0.13-micron process. This should immediately raise a flag considering that every other DirectX 8.1-compliant GPU has around twice as many transistors; it also holds the key to Trident's ability to produce a low-cost and low-power DX8.1 GPU.

The XP4 features four rendering pipelines with two texture units per pipeline, just like its competitors (GeForce4 & RADEON 8500). The part even has two vertex shader pipelines just like the GeForce4, yet it boasts only half the transistor count of the GeForce4. The trick to this is Trident's unique shared-pipeline architecture.

In order to implement a single pixel-rendering pipeline, every manufacturer must allocate a certain number of transistors to implementing all of the functionality of that single pipeline. These rendering pipelines have been perfected to the point where virtually all manufacturers spend about the same number of transistors here; for simplicity's sake, let's say that the first rendering pipeline requires 15 million transistors to implement. The approach both ATI and NVIDIA take to implementing the remaining three pipelines is to make a carbon copy of the first one, thus requiring 15 million more transistors per pipeline or around 60 million total for the four pipes. Here's where Trident differs: Instead of duplicating all of the

logic for each pipeline, Trident shares much of the logic between the Nth pipeline and all of the pipelines that came before it. In the case mentioned above where the first pipeline requires 15 million transistors to implement, with Trident's architecture the second pipe only requires 7.5 million transistors, followed by ~3.8M for the third and ~2M for the fourth.

The benefit here is crystal clear: the chip is much lower in transistor count, which translates into a cooler-running, lower-power chip (requiring less expensive power circuitry on the board). The chip is also much cheaper to manufacture thanks to a very small die. The downside to Trident's shared approach is that the performance will never be as high as a solution with four completely independent rendering pipes with no shared logic.

The XP4 is Trident's first GPU to implement this architecture, and in doing so it is able to offer full DirectX 8.1 programmability through programmable pixel and vertex shaders, in a solution that will retail for less than \$100.

	Trident XP4 T1	Trident XP4 T2	Trident XP4 T3
Core Clock	250MHz	250MHz	300MHz
Memory Bus	64-bit DDR	128-bit DDR	128-bit DDR
Memory Clock	250MHz	250MHz	300 - 350MHz
Memory Size	64MB	64MB	128MB
Price	\$69	\$79	\$99

According to Trident's performance estimates, the XP4 T3 should deliver 80% of the performance of a GeForce4 Ti 4600 at a MSRP of \$99. To put this in terms that are easier to understand, the XP4 T3 can offer the performance of a GeForce4 Ti 4200. The T2 is even more interesting for the mass market, as it will be able to offer the performance of a RADEON 9000 Pro at \$79. At the time of publication, Trident was close to their performance goals but still around 10 to 20% off target; by the time the XP4 ships in October they hope to have all of the kinks worked out. If they can pull it off, Trident's XP4 would indeed be one of the more impressive comebacks of 2002. ■

Anand's busy tinkering with hardware at Anand@cpumag.com.

Summer Catch Up

During the annual summer lull while the hardware world gears up for the fall season onslaught, go outside and cause some mischief or something. But before you go, let me just jot down a few upcoming hardware specimens, which I'm looking forward to "testing."

AMD is ramping up its Thoroughbred-based Athlon XP lineup, letting loose 2400+ (\$193) and 2600+ (\$297) processors in an attempt to snatch back the performance crown from the current owner, Intel's Pentium 4 2.53GHz. When put through AMD's nomenclature, that represents clock speeds of 2GHz and 2.133GHz, respectively. Although this will mark the first time AMD has breached the 2GHz barrier, Intel is already focused toward 3GHz, but AMD's IPC advantage could still make the performance delta interesting. It's also worth noting that AMD has upped the ante considerably (200MHz and 333MHz) since its last speed bump of a mere 66MHz for the 2200+.

Manufactured in AMD's Dresden FAB 30 and on a 0.13-micron copper process, the die-size has been increased from 80mm² to 84mm², which is still considered "mini" by today's standards. The transistor count has been upped from 37.2 million to 37.6 million. This isn't the Holy Grail Barton core though, thus the total cache remains at 384KB. A new 333MHz FSB has circulated on the rumor mill, but in reality, it'll be the same ol' 266MHz for now. Sigh . . .

Despite possessing a great "bang for your buck" in terms of performance, the first Thoroughbred Athlon XP 2200+ was frowned upon by overclockers for apparently reaching a frequency ceiling. Just like Jay & Silent Bob, you can't fault them for trying, but they just weren't getting any. To push the Athlon XP's frequency that bit higher, AMD's engineers had to successfully implement a process change for the Thoroughbred, which involved adding an extra layer of metal to reduce the resistance and capacitance. Water-cooling isn't meant for the

mainstream, unfortunately, so they had to take the boring route. Specifically for the Athlon XP 2400+ and 2600+ additional decoupling capacitors have been engineered to reduce electromagnetic interference. Current socket-A-based AMD platform owners needn't worry; the new Athlon XPs should be compatible with your motherboards.

A couple of early benchmarks from AMD's labs compared with Pentium 4 2.53GHz review scores (August *CPU*, page 26) show very competitive performance. 3DMark 2001SE shows the 2600+ at 11102 to the P4 2.53GHz' 11435, while Quake III has a score of 262.73 for the 2600+ and 309 for Intel's offering.

An announcement should be made by the time you read this but wasn't at press time so mum's the word on the final pricing, I'm afraid. It's safe to say that both new AMD CPUs will still cost less than top-end Pentium 4s. Once more benchmarking is done and final pricing set, a judgment can be passed. Until then, it's clear that the gap is closing.

But wouldn't you know it? Intel hasn't been sitting still either. . . . Comparisons will soon have to be made with a faster Pentium 4, as the P4

2.8GHz has just arrived on my doorstep. Once again, it's another significant increase from 2.53GHz, and it seems as though it really can't be long before 3GHz is broken. I'll have a full review of both for y'all next month. As an interesting side-track, it's worth mentioning that for the first time in eons, my benchmark systems will not include an NVIDIA graphics card for 3D. Instead, an R300-based RADEON 9700, which raises the performance bar in every way, will fill the AGP slot for both systems. Until then, read the mag cover to cover, start saving for a 9700, write Anand some nice email, send knickers and P4 1.6As to Kyle, and wish Samit all the best on tying the knot. Cheerio. ■

Email me your hardware wants and Shark Week thoughts at sharky@cpumag.com.

Although this will mark the first time AMD has breached the 2GHz barrier, Intel is already focused toward 3GHz.

Disrupting Reuters' newswire with a cheery Christmas greeting at age six, Alex "Sharky" Ross became an avid computer user/abuser, eventually founding popular hardware testing/review Web site SharkyExtreme.com. Exposing shoddy manufacturing practices and rubbish-spouting marketing weasels while championing innovative products, illuminating new technology, and pioneering real-world testing methods was just a front for playing with the best toys. The site acquired, he left in 2001. A London native and London School of Economics graduate, Alex currently swims in Silicon Valley.

SiS Is Getting Serious



Kyle Bennett is editor-in-chief of HardOCP.com, one of the largest and most outspoken PC-enthusiast sites on the Web. HardOCP.com is geared toward users with a passion for PCs and those who want to get cutting-edge performance from their systems. Beware, though, Kyle is known for his strong opinions and stating them in a no-nonsense manner while delivering some of the most in-depth reviews and PC hardware news on the 'Net.

If you don't know who SiS is, you might soon. Silicon Integrated Systems (www.sis.com) is a core logic company in Taiwan. You know, the whole north bridge/south bridge thing on your mainboard? SiS is one of the guys that makes them, much like its neighbors VIA (www.viatech.com). While they are very much the same, they are very different, as well.

While VIA has its chipsets made by a fabrication process owned by TSMC (www.tsmc.com), SiS builds its own, giving it a bit more control. Another area it differs is that while many mainboard builders are uncomfortable with building Pentium 4 mainboards with VIA chipsets—due to them not being licensed by Intel—builders have embraced SiS simply due to its licensing. This situation has left SiS being much the only other chipset choice for Pentium 4 mainboards, besides Intel itself.

Because SiS has pricing control over its own chips, it has been able to keep pricing on the chipset fairly inexpensive. Still, even the fact that SiS has deeper pricing control and Intel's blessing to build Pentium 4 chipsets is still not enough to carry any chipset company. There still has to be top-level performance given to the guys out there that build their own boxes.

Things are changing, though, and odds are this is going to be a good thing for the enthusiasts out there. I know many folks nowadays that profess loyalty to AMD and even VIA. If you would have asked them to use an AMD or VIA system two or three years ago, they would have looked at you like you were crazy. Intel was certainly the way to go. Now we see that up to 90% of the gamers out there that build their own boxes or buy their own boxes from small-system integrators have an AMD CPU and a VIA chipset in their systems. In comparison, if you had asked me to use a SiS chipset in my gaming box even earlier this year, it certainly would not have been my first choice—or my second. But where is SiS today?

I just got done testing SiS's new 648 chipset for the Pentium 4 here at [H]ardOCP last week, and I have to say that I was really surprised with the

results. The SiS 648 has official support for single-channel DDR333. Unofficially it has support for DDR400. We tested with both DDR333 and DDR400 and found that in business- and content-application benchmarks the SiS system, when compared to an equivalent Intel i850E box equipped with the speedy PC1066 memory, performed even better than the Intel box when the SiS system utilized DDR400. Even running the DDR333, the SiS box was giving a few leads and taking a few others. Even more remarkable, we had no driver or stability issues with the board that were not immediately worked out. This is truly a huge step forward for SiS.

3D gaming is where it is at, though, and this is where SiS AGP driver implementation has always held it back. In our testing, the SiS 648 performed again on par with the Intel i850E solution using PC1066 RDRAM, beating it in some benchmarks and losing a couple others by small margins. SiS did a much better job at delivering the flawless frame rates than it ever has before.

Is there a new sheriff in town? I wouldn't go as far as to say that, but certainly there is a new contender in the market if it continues on this path. If SiS can implement its current memory-controller performance into its AMD platform chipsets and the stability we have seen, there could be a coup in the chipset world. Take the performance and stability we have seen and add to that boards that can be very inexpensive (sub U.S. \$120), and SiS might not only find itself gaining ground in the gaming market, but it is also sure to get the attention of the system integrators, as well.

SiS looks poised to be the next rising star in the chipset world, and with the pricing leverage it can apply, the only obstacle for it will be performance and stability, and it looks as though those are two issues it is fully aware of and has addressed. ■

I just got done testing SiS's new 648 chipset for the Pentium 4 here at [H]ardOCP last week, and I have to say that I was really surprised with the results.

Talk with Kyle at kyle@cpumag.com.

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AUDIO 

IMAGES 

DATA 

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DVD-CPU

Each month we ask a staff writer to take on our publication editor in a challenge to build the best PC for a certain price. Because our writers don't want to lose their jobs, they always accept this challenge willingly. Tempers will flare. Tools will fly. But only one will prevail.

This month the challenge is to build the **Best Video-Editing System For Less Than \$2,000.**

Samit

I'm gonna have to be honest here; I've never done anything in the realm of digital video editing. Zilch. Zip. Nada. Then there's my adversary, Michael: Video editing is his beat here at CPU headquarters, so I can only assume that he'll have the upper hand. But that's what makes life interesting, isn't it? There's nothing I like more than the smell of a PC Challenge in the morning.

I picked high-end hardware to build for the future, and I wanted all the important connectors. As you can see from the specs, this system is no slouch and should keep you happily editing for a few years: A 2.26GHz Pentium 4 processor, 1GB DDR RAM, FireWire, USB 2.0, RAID support, 80GB and 40GB hard drives, TV capture (with analog inputs for your VCR), top-of-the-line HP DVD+RW drive (along with all the bundled software), ATI RADEON 9000 video card, dual 17-inch Mag monitors running on ATI's HydraVision, plus additional editing and authoring software.

I borrowed a DV camcorder and started shooting. Pretty soon I got to thinking I was the next M. Night Shyamalan (minus the talent, some naysayers may argue) shooting "The Unbreakable Signs Of The Sixth Sense." Oddly, most of my hour-long shoot ended up on the cutting room floor, leaving me with a paltry seven-minute movie. Not to worry; as an Insidious artist, I scoff at critics. What do they know about films

anyway? MUHAHahaha-haha. As an Indian, I have the blood of Bollywood (Say "shava shava") coursing through my veins.

Putting my directorial ego aside for a minute, I edited my home movie with transitions and customized audio in Pinnacle Studio Version 7. Then I used Ulead DVD MovieFactory to create DVD chapters and custom backgrounds with music and then wrote it to chapters for my movie. I took the DVD-RW and threw it into a Sony DVP-NC655P DVD player and watched my production with ease. I then repeated this test and created a VCD and SVCD.

Next up: Capturing my high school graduation from my VCR to the hard drive using the ATI TV Tuner card. I dubbed in my own commentary and music and voila: my second movie. I called the experts at ILM (Industrial Lights And Magic) to give the Insidious One (that's me) some on-screen mojo, but they were busy working on "Star Wars: Episode 3." Losers. Fortunately, my anger waned as I watched some "South Park" and captured a few episodes to the hard drive and wrote them on a DVD+RW to view at my convenience.

You overseas readers will delight at the speed with which this system can rip DVDs using programs like SmartRipper. The high-end system specs will give you the power to edit and render IFO/VOB files with ease and then use Nero 5.5.9.0 to write custom DVDs.

Want to convert a PG-13 into a G for the kids? No problem, muchacho. You a big gamer? Take a look at adding faster DDR and dropping in an ATI RADEON 9700 Pro.

(See the review on page 20.) I'm off to make more movies. Adios. ▲

THE PC CHA



Samit Choudhuri
Publication Editor
Computer Power User

Component	Model	Price
Case	Sky Hawk AL-4387 Aluminum with front I/O Controller ¹	\$50
Motherboard	ASUS P4B55-E (Intel 845E chipset) with FireWire and USB 2.0 ¹	\$166.92
Processor	Intel Pentium 4 2.26GHz with 512KB cache (533MHz bus) ¹	\$253.87
Memory	Crucial 1GB PC-2100 DDR (2 X 512MB) ²	\$333.54
Hard Drive #1	Maxtor 80GB 7200rpm ATA/100 ^{3*}	\$139.94
Hard Drive #2	Western Digital WD400BBRTL 40GB 7200rpm ATA/100 ⁴	\$69.99
Video Card	ATI RADEON 9000 64MB DDR ⁵	\$79
TV Tuner/Video Cap	ATI TV Wonder VE PCI Card (Analog Video Capture) ^{6*}	\$49.99
Sound Card	Built-in 6-channel Audio	N/A
Network Card	Built-in Ethernet	N/A
Modem	No-dem modem in this system	N/A
DVD+RW	HP DVD Writer dvd200i ⁷	\$399
Diskette	Panasonic SFD-321B 1.44 ⁹	\$9
Monitor	Mag 770FS 17-inch x 2 ^{6*}	\$279.98
Speakers	Harmon Kardon D430 ¹⁰	\$6.26
Mouse	Microsoft Wheel Mouse Optical ^{6*}	\$14.99
Keyboard	Microsoft Internet Keyboard ^{6*}	\$24.99
Operating System	Microsoft Windows XP Home (OEM) ⁷	\$84.99
Software	Pinnacle Studio Version 7 ¹	\$45.95
	Ulead DVD MovieFactory (download) ⁸	\$44.95
Miscellaneous	Sky Hawk SH-400A8H 400W Aluminum Power Supply ¹	\$55
	Mwave 80mm Ball Bearing Case Fan ¹	\$3.50
Subtotal		\$2,111.86
Shipping		\$53.76
Tax		\$20.69
Rebates/Coupons		\$190
Total		\$1,996.31

*Items with rebate/coupon

Purchased From:

1 Mwave.com	5 ENET Marketing	8 Ulead Systems
2 Crucial.com	6 Best Buy	9 Newegg.com
3 Staples.com	7 Eagle Computer Systems	10 Computer Geeks
4 Circuit City		



CHALLENGE



Michael Sweet

Staff Writer
Computer Power User



Michael

I suspect Samit will use his \$2,000 to build a super speedy powerhouse, which is all well and good. But if he blows his cash on the latest Pentium processor and a gig of RAM, he won't have much money left over for the video-editing hardware. Samit's machine will be faster than mine, but my rig will be more useful for video-editing hobbyists.

But my PC is no slouch when it comes to raw power. I based it on an ABIT NV7-133R motherboard with an AMD Athlon XP 1800+ and 512MB of Crucial DDR SDRAM. I set up a RAID configuration with two 60GB hard drives, which will give my system a performance boost and provide ample room for video clips. I chose Matrox's G550 video card for its DualHead capabilities, plus it's probably the best 2D card available. I set up a dual display with a 19-inch Samsung monitor and a 25-inch RCA TV so I could preview my work on a big screen.

A video-editing machine without a DVD burner is hardly a video-editing machine, so I installed a Pioneer DVR-104 DVD-RW drive. The Pioneer drive also records to CD-R and CD-RW, so I decided to skip a second optical drive and save a

little cash. I added a set of Logitech Z-340 speakers, which sound good for a 2.1 system. I also picked up a Logitech microphone so I could add voice narration to my videos.

I knew from the start what kind of video-capture hardware I wanted. I *could* have added a FireWire card and some video-editing software and called it a day, but that would only work for DV camcorders. I wanted my system to be able to record from (and to) analog equipment as well as DV, so I bought Studio Deluxe 7 from Pinnacle Systems. Studio Deluxe 7 includes a video capture card with two FireWire ports and a "breakout box" that includes composite A/V and S-Video connections. I bought a cheap VCR so I could capture video from old VHS tapes and convert them to DVDs. I can also record video to VHS, so I can make home movies for friends and family who have yet to buy a DVD player. The bundle also includes a full version of Pinnacle Systems' excellent Video Studio 7 software. Of course, movies just aren't movies without the soda and popcorn, so I sprang for that too.

I'm sure Samit's setup is plenty fast, but where's the flexibility? My PC is a complete home video studio, ready to tackle any video-editing job. ▲



Component	Model	Price
Case	Generic w/300-Watt power supply ¹	\$49.21
Motherboard	ABIT NV7-133R ²	\$88
Processor	AMD Athlon XP 1800+ ³	\$79
Memory	512MB PC2100 DDR-SDRAM (Crucial) ²	\$138
Hard Drive	60GB Western Digital x 2 ⁵	\$179.98
Video Card	Matrox G550 ³	\$115
Sound Card	Integrated	N/A
Network Card	Integrated	N/A
Modem	N/A	N/A
DVD-RW	Pioneer DVR-104 ⁶	\$255
Diskette	Mitsumi ²	\$9
Monitor	Samsung 19-inch* ⁴	\$299.99
Speakers	Logitech Z-340 ²	\$36
Mouse	Logitech optical ²	\$11
Keyboard	Belkin ⁷	\$11.99
Operating System	Microsoft Windows XP Home ³	\$92
Video-editing Hardware	Pinnacle Video Studio Deluxe ²	\$254
Miscellaneous	Microphone ⁴	\$12.99
	TV ⁴	\$199
	VCR ⁴	\$49.99
	Arcic Silver 3 Thermal paste ⁸	\$4.95
	RCA cables ⁴	\$19.98
	Tweakmonster Shim ⁸	\$6.50
	Audio Cable (6)	\$2
	Volcano 7 Heat Sink ⁸	\$17.50
	Coca-Cola ⁹	\$1.49
	Popz popcorn ⁹	\$0.89
Subtotal		\$1,933.46
Shipping		\$53
Tax		\$53.74
Rebates		\$50
Total		\$1,990.20

*Item with rebate

Purchased From:
1 D&E Technical Service
2 Newegg.com
3 GoogleGear.com
4 Best Buy

5 Circuit City
6 Essential Computers
7 Office Depot
8 PC Pitstop
9 U-Stop

And The Winner Is...

Looking at Samit's system, I got the feeling that deep down, he was wondering when he could put away the camcorder and pick up where he left off in Unreal Tournament. The RADEON 9000 he chose is better in the 3D realm than Michael's G550, but we're talking video editing, not gaming. And as Michael points out, the Matrox card he chose, though older, has a higher RAMDAC and is one of the best around for 2D—perfect for video editing. (The Parhelia would have been nicer, but it's still a bit pricey.) Michael's 512MB of RAM isn't as good as Samit's gig, but it's sufficient, and the RAID configurations in both systems provide lots of room for home movies. Samit has a slight edge in the optical drive department in terms of DVD+RW compatibility, but with those standards still sorting themselves out, that's hard to pin down. The Pinnacle software both chose is a comprehensive and capable program, even if some of the transitions look a bit amateurish. There's no question that Samit built a more powerful system, but is more power always better? Michael's PC has everything you'll need for your next video-editing job. I keep coming back to the monitor vs. television. There's a good argument for Samit's dual monitors over the television, VCR, and monitor setup Michael chose: Most people already have several televisions and VCRs at home that would do the trick. But I have to judge on what's here, not what could be added from home. That makes Michael the winner.



De-TERMINATOR

Jennie "Show Me Your Home Video" Schlueter

Swappin' Parts

~~There's A Transformation~~ ^{Took} ~~Taking~~ Place

Each month in "Swappin' Parts," a Computer Power User writer upgrades one out-of-date component in our test machine, MERLE (Mediocre Electronic Refurbished Low-end Equipment). We're finished now, having transformed MERLE from a silicon trash can into a powerful system we'd be proud to put in our own homes. We modded MERLE's case and updated his CPU, sound card, speakers, video card, RAM, optical drive, case, PSU, monitor, motherboard, and cooling system. Whew. The final touch is upgrading his OS.

And so we have come to the end, MERLE. So much about you has changed, my digital friend. When we met, you truly lived up to your acronym: Mediocre Electronic Refurbished Low-end Equipment. We laughed at you then, but now we admire you. Your sleek, freshly painted aluminum cage bristles with some of the best hardware money can buy. You tower above the other PCs in our testing lab.

There's little more we can do to you, MERLE. We've poked and prodded your insides enough. Yet, there's one last task to be done. For months, we've saddled you with WinMe, and you deserve better. You deserve WinXP Pro. This month's upgrade is your final rite of passage, MERLE, from a homely and weak PC-wannabe to a full-fledged power user's PC. We'll erase your awful memories of days when you were forced to crunch graphics with a lowly ATI Xpert 98 video card, when you could muster only 10GB of storage space, and when you would struggle to play a tune. When you awake from this upgrade, your last traces of MERLEness will be gone.

The Reformation

I knew upgrading MERLE's OS would be as easy as pie—even easier because I

rarely make pies. I dropped the WinXP Pro disc in MERLE's optical drive, and soon a cheery WinXP window popped up. I chose to install WinXP, clicked Next, and followed the instructions the WinXP

installation wizard provided. I chose to upgrade WinMe rather than run a full install and clicked Next again. The next several steps are a bit of a bore, so let's run through them quickly, shall we?

I accepted the license agreement and entered the product key in the following two steps. The wizard asked if I wanted XP to show potential hardware and software issues with the new OS. I chose Yes. The report appeared, and I found there wasn't much to worry about. I'd have to reinstall a couple of drivers for the ASUS motherboard and the ATI RADEON 8500DV video card, but that was all. Next I had the option to download update files for WinXP, which I skipped. MERLE restarted his engine, and the WinXP installation was properly under way.



One of MERLE's first upgrades was getting a shiny new Creative Labs Audigy Platinum sound card.



MERLE in his new digs (May 2002 CPU).



Nearly finished. MERLE gets a new look for our September 2002 CPU issue.

1.4GHz AMD Athlon. MERLE clearly appreciated his newfound power, but that was only the beginning.

For January's 2002 issue, I went to work on MERLE again, this time giving him a Sound Blaster Audigy Platinum card. He thanked me by slicing a couple of my fingers, a trespass I would not forgive for many months to come. MERLE's onboard audio chip left quite a bit to be desired, but he roared like a heavy-metal god when the upgrade was complete.

Chad took over the MERLE upgrading duties for the February 2002 issue, pumping MERLE's memory up four-fold with 512MB of PC133 SDRAM. My fingers had sufficiently healed enough by the March 2002 issue for me to install a proper video card in MERLE—an ATI All-In-Wonder RADEON 8500DV. We could feel MERLE's confidence growing with each upgrade, and by this point, he was turning into a pretty respectable computer.

But there was much more to do. MERLE continued to watch his evolution unfold as WinXP soldiered on, removing his old personality bit by bit.

For the April 2002 issue, Marty twisted a few arms and scored a Pioneer DVR-A03 DVD-RW drive. With the ATI video card and DVD-RW drive, MERLE had the power to make movies, and we think it went to his head. He kept trying to get Natalie Portman to sign on to some sort of nefarious film project he had cooked up, but alas, she had other plans.

Moving Day

The following month, MERLE moved from the pedestrian confines of his steel and plastic case to his palatial Lian Li PC-70 digs. Cal did the honors, outfitting MERLE with a mighty Enermax EG465P-VE power supply to boot. MERLE literally crackled with electricity, and his new case looked oh-so sharp.

Linda provided MERLE with a much needed monitor upgrade for the June 2002 issue. She chose a Sony CPD-G520, a mother of a monitor that matched up well with the huge case Cal gave MERLE the month before. By this point, we had replaced just about everything of importance in MERLE—everything but the

kitchen sink, which in computerspeak means the motherboard. MERLE was still confined to the Biostar board, but that (and many other parts) was about to change.

Marty undertook MERLE's single largest upgrade session for the July 2002 issue. Not content with a mere motherboard replacement, Marty was resourceful

**We poured blood,
sweat, and several
thousand dollars of
someone
else's money
into our baby.**

enough to procure a new CPU and a better batch of memory. Marty ripped out the Biostar motherboard and replaced it with a smooth ASUS A7V333 board, a fast Athlon XP 2100+ CPU, and 512MB of Corsair PC2700 DDR-SDRAM. MERLE blasted through games and applications with ease. He was a muscular machine, but he had a tendency to get a little hot under the collar, so Chad resolved to cool him down for the August 2002 issue. Little did MERLE know he was headed for disaster.

Knockin' On Heaven's Door

Chad meant well when he began upgrading MERLE's cooling abilities. Chad gave him a DigitalDoc5 temperature sensor, a new ThermalTake Volcano 7+ heatsink and fan unit for the CPU, and a suite of fans to keep MERLE chillin'. He installed the DigitalDoc first and began to install the ThermalTake heatsink and fan when it happened.

Maybe MERLE was being petulant. Maybe he felt he had grown so powerful no one could touch him anymore. Or maybe Chad's fingers simply slipped at the wrong time. Whatever happened, by day's end, MERLE had a cracked CPU and a toasty, smoking motherboard. Rumors abounded that a deranged writer who had it in for MERLE had sabotaged him.

These rumors are false, as far as you know. In any case, MERLE had flatlined. Chad was able to revive MERLE by replacing his smoldering innards and (eventually) finished installing MERLE's fans. MERLE took a deep breath, and all was right again.

My WinXP upgrade was nearly finished, but MERLE's old consciousness held out long enough for him to take one last glimpse of his former self.

For the September 2002 issue, Samit gave Cal and I the task of modifying MERLE. This particularly excited me because it gave me the excuse I needed to cut MERLE but good—just as he had done to me so many months before. I handled the hardware, cutting and installing a window for MERLE's case and adding a neon light. Cal took care of the aesthetics, conceiving a slick paint scheme for MERLE that would make his already sculpted physique look even better. We added a couple of fan grills for kicks, and when we were finished, we saw before us one seriously cool PC.

Coda

The last remnants of the original MERLE faded into oblivion as WinXP finished upgrading. About 30 minutes had gone by, which is eons in computer time, so hopefully MERLE was able to enjoy his final reverie. WinXP asked if I wanted to register or not, which I promptly skipped. I finished the upgrade by creating a new username and a password for once-MERLE and reinstalled the necessary software for the motherboard and the video card. The Great Conversion was finished.

MERLE wasn't always the easiest PC to work with, but we enjoyed watching his transformation. We poured blood, sweat, and several thousand dollars of someone else's money into our baby. We had fun with him, we cursed at him, but most important, we turned him into a true power user's PC.

This is the last you'll see of MERLE, but don't despair. Samit is meticulously planning the next generation of "Swappin' Parts." The cycle of life begins again. **cpu**

by Michael Sweet

X-ray Vision: Is 8X The Last Of AGP?

If you've avoided buying a graphics card or motherboard featuring AGP 8X because you want to wait for AGP 16X, your wait probably will be a long one. As in forever.

Although the AGP (Accelerated Graphics Port) interface has provided a great boost in 3D graphics performance, its time as the top dog among graphics interfaces probably will come to an end in the next few years as a form of PCI Express jumps to the forefront. While you're waiting for the next great graphics interface, though, AGP 8X should provide solid performance.

The 8X Speed Advantage

Developers designed AGP, which began appearing commonly in computers in the late 1990s, as a dedicated graphics bus that provided improved speeds over what was available with PCI. The interface began as AGP 1X and evolved to AGP 2X, AGP 4X, and finally AGP 8X. (See the "AGP Versions" sidebar.) According to the specification for AGP 8X, its official name is the AGP 3.0 standard. However, to avoid confusion with the previous versions of AGP, all of which have unique specifications, we'll stick with AGP 8X.

AGP 8X uses a 32-bit bus, as does AGP 4X. However, AGP 8X can offer data transfers as fast as 2.1GB per second, about double the data transfer speed AGP 4X offers. AGP 8X is able to improve on the performance of AGP 4X for a few reasons:

Clocking scheme. AGP 8X's effective clock rate of 533MHz is about double that of AGP 4X's 266MHz.

Isochronous data transfer. Many streaming video applications require continuous data transfer. By supporting isochronous data transfers

(transfers that must happen within a certain time period), AGP 8X can prevent delays in data transfer.

Pentium 4 chips. AGP 8X and Pentium 4 systems go together because Pentium 4 systems offer fast buses throughout the chipset and on the motherboard, letting the system take better advantage of AGP 8X's increased bandwidth.

Signal interface differences. A new signaling scheme in AGP 8X makes for improved use of the individual pins on the AGP connector, even though both AGP 8X and AGP 4X use the same connector scheme.

Several recently released products are providing support for AGP 8X. Silicon Integrated Systems' Xabre400 graphics chip, released in April 2002, was the first AGP 8X graphics chip. The nForce2 chipset, which NVIDIA released in July 2002, also offers support for AGP 8X.

Potential Problems

Although simple mathematics tell us AGP 8X should transfer data twice as fast as the AGP 4X standard, other components in your computer can affect the speed the graphics bus is able to achieve. For example, a graphics card containing slow memory chips could cause an overall slowdown in the graphics processing, using less than the AGP 8X bus' full capacity.

AGP 8X also doesn't offer full backward compatibility with older graphics cards that support only AGP 1X or AGP 2X. Such cards probably won't work correctly in an AGP 8X system.

PCI Express On Deck

Finally, although AGP 8X is only in its early stages of implementation, plans for its replacement are already under way.

Several companies, including Intel, Microsoft, and IBM, are involved in the development of PCI Express, also known as 3GIO. (See page 48 of the June *CPU*; the PCI-SIG recently replaced the code name 3GIO with PCI Express.) The PCI Express standard, also sometimes known by its working group's name, Arapahoe, will provide an upgrade for both the AGP and PCI buses. Some members of the working group say PCI Express might consist of a series of standards, one of which would focus on graphics and be called Serial AGP.

AGP Versions

AGP has undergone a few version changes in the past few years.

AGP 1X

Clock rate: 66MHz
Transfer rate: 266MBps
Signaling: 3.3V/1.5V
Specifications supported: AGP 1.0 and AGP 2.0

AGP 2X

Clock rate: 133MHz
Transfer rate: 533MBps
Signaling: 3.3V/1.5V
Specifications supported: AGP 1.0 and AGP 2.0

AGP 4X

Clock rate: 266MHz
Transfer rate: 1.06GBps
Signaling: 1.5V/0.8V
Specifications supported: AGP 2.0 and AGP 3.0

AGP 8X

Clock rate: 533MHz
Transfer rate: 2.1GBps
Signaling: 0.8V
Specifications supported: AGP 3.0

PCI Express' official specifications remain in the development phase, but analysts expect that the bus will support widths of between 1 bit and 32 bits. Each bit, referred to as a lane, will provide a bandwidth of 0.31GB per second, meaning the maximum overall

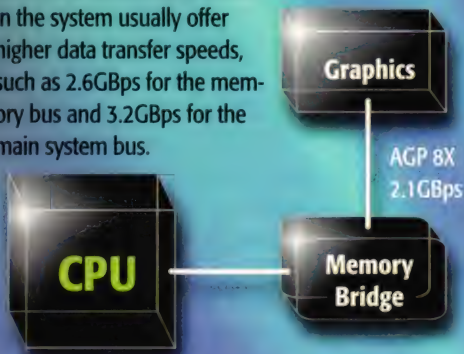
graphics bus bandwidth (at 32 lanes) would be about 10GB per second. In addition to its improved data transfer speeds over AGP, PCI Express will save space on the motherboard, helping engineers make better use of the space inside the computer.

PCI Express might make its first appearance in products early in 2004. Intel expects to begin manufacturing chips that utilize PCI Express in the second half of 2003. **CPU**

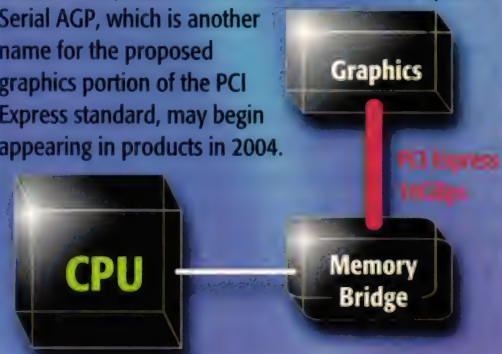
by Kyle Schurman

From AGP To PCI Express

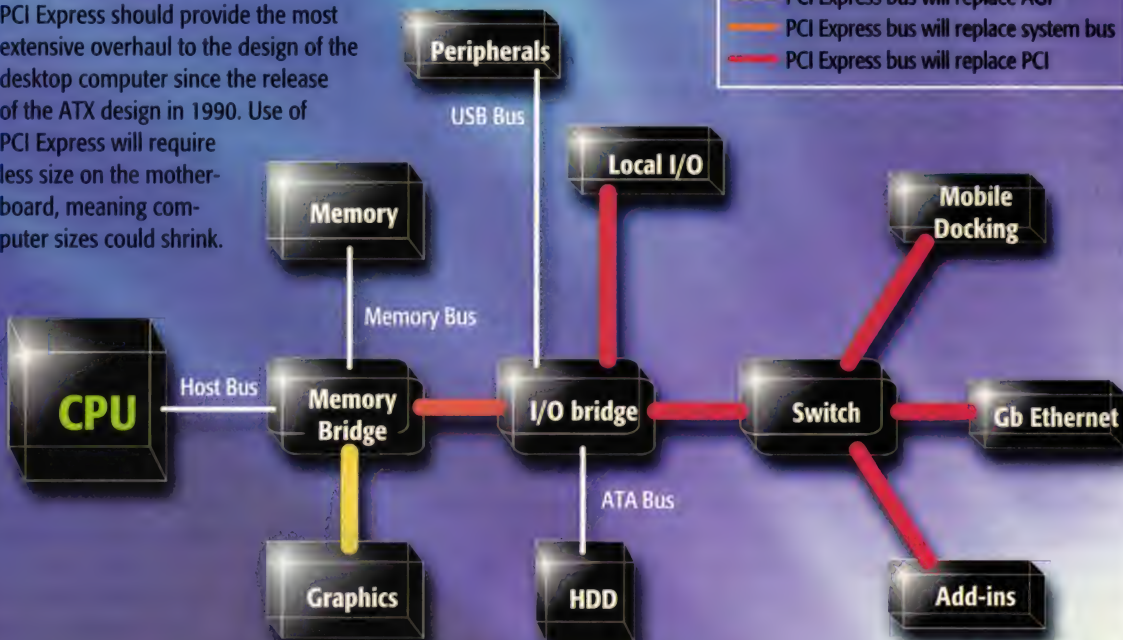
Although AGP 8X offers solid data transfer speeds, it still could cause some system bottlenecks because other buses in the system usually offer higher data transfer speeds, such as 2.6GBps for the memory bus and 3.2GBps for the main system bus.



With the eventual replacement of the AGP 8X standard with PCI Express, data transfer speeds on the graphics bus could reach 10GBps, which should exceed the speeds of most other buses in the system. Serial AGP, which is another name for the proposed graphics portion of the PCI Express standard, may begin appearing in products in 2004.



When the PCI Express standard appears regularly in products in about 24 months, it will improve the overall data transfer speeds in computers by replacing several buses. Intel says PCI Express should provide the most extensive overhaul to the design of the desktop computer since the release of the ATX design in 1990. Use of PCI Express will require less size on the motherboard, meaning computer sizes could shrink.



KEY

- PCI Express bus will replace AGP
- PCI Express bus will replace system bus
- PCI Express bus will replace PCI

Radeon 9700

ATI Gets A Leg Up In The Graphics Race

In many aspects of life, being first is the ultimate goal. In the technology industry, although being first is advantageous, it also can be a little scary. What if you're first to the marketplace with a technology, only to have the rest of the industry reject it or to have your competitor squash it two months later? So it's not only important to be first to the market with a product in the technology industry, it's also important to create high-quality products with features the industry can support.

ATI Technologies has leapt ahead in the graphics industry with its next-gen graphics chip, the Radeon 9700. ATI's chip reached the market a few months ahead of the expected release date of the next-gen chip (NV30) from the current industry leader, NVIDIA. Although it might be natural for a few ATI officials to be nervous about being first to the market, they probably have little to worry about. The Radeon 9700 offers some impressive features and technologies that should have plenty of success.

New & Improved

The 9700 offers plenty of new and revamped technologies, including eight parallel rendering pipelines, DirectX 9 support, AGP 8X support, and program-mable floating point architecture. The chip features dual integrated display controllers, dual integrated 400MHz DACs, and support for TV and HDTV playback. This latest offering more than doubles many of the capabilities of ATI's previous-generation chip, the Radeon 8500. The 9700 contains 107 to 110+ million transistors (ATI's technical specs offer varying numbers) and four vertex shader engines.

You many have heard the 9700 referred to as the R300, which is the name of the chip it's based on. ATI released the specifications for the 9700 VPU (visual processing unit) in July. At the same time, ATI released the Radeon 9000 chip, which ATI is aiming at mainstream PCs. The 9700 chip will appear in high-performance computers.

9700 Pro graphics boards based on the 9700 VPU became available in August with prices around \$400. (See our review on page 20.) Graphics boards based on the Radeon 9000 chip cost about \$125. ATI's board partners should release a "plain" Radeon 9700 board with slightly lower memory and clock speeds later this year. As with other products in the Radeon family, 9700 and 9000 products will appear for PC and Mac platforms and in both desktop and notebook computer configurations.

Key Technologies

The Radeon 9700 contains several key technologies that ATI hopes will take graphics rendering to the next level: cinema-like realism. Many of the technologies are significant improvements over what was available in previous ATI chips.

256-bit memory interface. Using its 256-bit, DDR memory interface, the 9700 can move up to 20GBps of data through graphics memory. The memory interface makes use of four 64-bit memory channels, each of which communicates independently with the graphics memory. This means one memory channel could be writing data into

the graphics memory, while another memory channel is reading data. The Radeon 9700's use of sequencer logic lets it ensure the chip is using each of the four channels to their maximum capabilities.

The Radeon 9700's memory interface also contains support for DDR-II memory technology, which represents the next generation of memory technology. DDR-II, which should appear some time in the first half of 2003, should yield a 50% performance increase over DDR memory.

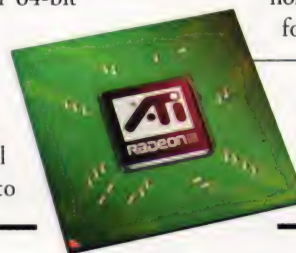
AGP 8X. The Radeon 9700 is the first graphics chip to provide support for the AGP 8X specification, designed to provide double the bandwidth for graphics processing over the previous standard, AGP 4X. The AGP 8X standard allows for a 2GBps AGP bandwidth.

The AGP bus carries several types of data, including 3D models, textures, shaders, drawing commands, and video streams. By supporting AGP 8X, the 9700 supports faster load times for all types of graphics, as well as higher resolution textures and more detailed 3D models.

DirectX 9. Even though Microsoft hasn't yet publicly released the specifications for DirectX 9, the upcoming version of Microsoft's technology that drives high-speed multimedia and games, the Radeon 9700 has built-in support for DirectX 9 features. These capabilities should give the 9700 a longer usable life. ATI says the Radeon 9700 also supports the latest OpenGL functionality.

FullStream. The 9700 uses FullStream technology to improve streaming video playback across the Internet. FullStream uses pixel shaders to remove blocky areas from streaming Web video, improving the overall quality. Although FullStream provides streaming video enhancements regardless of the Internet connection speed, those with slower connections probably will notice the most improvement.

Hyper Z III. ATI uses Hyper Z III technology to improve the overall performance of the Radeon 9700.



The Radeon 9700 Pro graphics board, released in August, is based on the Radeon 9700 VPU (visual processing unit).

Hyper Z III works to maximize the bandwidth contained in the Radeon 9700 by detecting any pixels that will be hidden in the final rendering. Hyper Z III discards those hidden pixels, potentially reducing the card's bandwidth consumption by as much as 50%. (For more on Hyper Z III technology, see the Hyper Z III graphic that accompanies this article at www.smartcomputing.com/cpumag/oct02/radeon.)

SmartShader 2.0. The SmartShader 2.0 technology provides a key component in the Radeon 9700's support for DirectX 9. SmartShader 2.0 is the latest version of ATI's programmable vertex and pixel shader acceleration technology. The new version of SmartShader will provide additional power and flexibility over the original version.

The Radeon 9700 is the first chip to incorporate SmartShader 2.0, which supports as many as 16 textures per rendering pass. The use of SmartShader 2.0 will accelerate the incorporation of cinema-like effects into games.

SmoothVision 2.0. The use of new anti-aliasing techniques in SmoothVision 2.0 gives the Radeon 9700 the ability to reproduce movie-quality video without any loss of performance. ATI has included its latest anisotropic filtering technology inside SmoothVision 2.0, too. SmoothVision 2.0 provides improved techniques for enhancing the quality of images in a 3D application.

TruForm 2.0. TruForm 2.0 runs ATI's higher order surface technology. TruForm 2.0 can create more realistic 3D scenes. The technology doesn't need to make any changes to the original artwork in the scene to create its 3D enhancements.

TruForm 2.0 works by adding polygons and triangles to a scene to smooth out the curved surfaces of objects. This process is called tessellation, and it improves the overall look of the scene. The Radeon 9700's extremely high processing capabilities let TruForm 2.0 work to its full capacity. (For more on TruForm 2.0 technology and tessellation, see the TruForm 2.0 graphic

that accompanies this article at www.smartcomputing.com/cpumag/oct02/radeon.)

VideoShader. With its VideoShader technology, the Radeon 9700 enhances the quality of video playback. VideoShader accelerates video streaming by using programmable pixel shaders. VideoShader applies noise filtering to video in real-time, creating high-quality, clean video.



The Radeon 9700's strong collection of technologies and features can yield impressive graphical images, such as this chimpanzee holding a butterfly.

Digital video editors will appreciate the capabilities of the VideoShader technology, too. You can apply real-time effects and filters to video streams, such as blurring, embossing, and outlining, when performing video editing.

Processing Engines

The Radeon 9700 employs a few different processing technologies, giving it incredible raw power.

Vertex processing engine. The Radeon 9700's vertex processing engine is the key component for creating objects and surfaces in the graphical image. All objects in a 3D graphical scene consist of interlocking triangles, and the vertex processing engine performs mathematical operations on the vertices at the corners of each triangle, creating the scene.

ATI says the 9700 contains the most powerful vertex processing engine ever designed. The Radeon 9700's vertex processing engine uses four parallel pipelines, letting it process vertex shader

data at unprecedented speeds of one vertex and one triangle per clock cycle. The four pipelines can process as many as 325 million transformed and lit polygons per second.

ATI has designed the vertex processing engine to handle vector and scalar operations at the same time, providing processing speeds that are as much as double those available under previous architectures.

Because vertex shaders usually consist of a mixture of vector and scalar operations, the simultaneous processing in the Radeon 9700's vertex processing engine makes maximum use of its processing power. Such high performance levels will be necessary in the near future as graphics processing continues its migration toward cinema-like realism. (Vector operations include those consisting of multiple components. Scalar operations include those with a single component.)

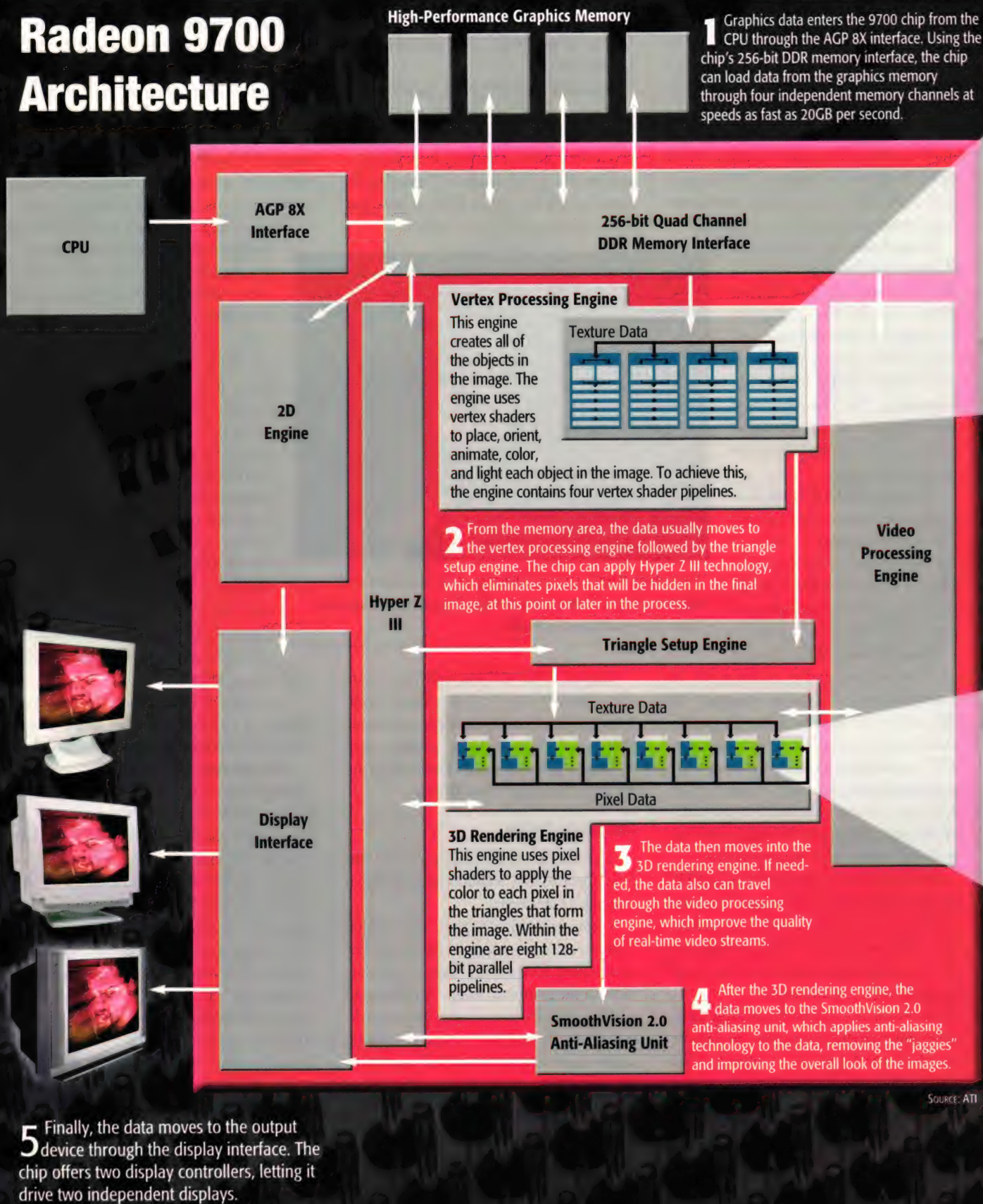
Once the data moves through the pipelines, it enters a triangle setup engine, which prepares the data for the rendering engine. Hyper Z III technology also can be applied to the data through the triangle setup engine.

The Radeon 9700's vertex processing engine is the first to fully implement DirectX 9's vertex shader specification 2.0.

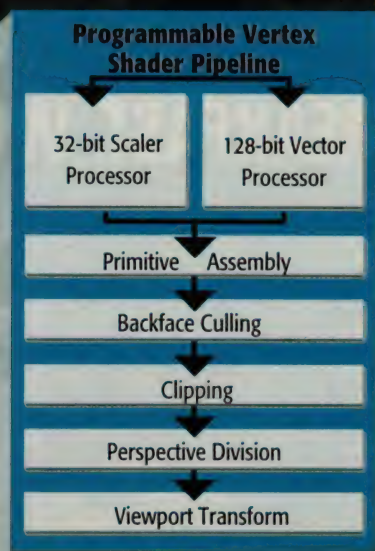
3D rendering engine. After moving data through the vertex processing engine, the Radeon 9700 already has lit and arranged the triangles making up the 3D scene. The triangle data then enters the chip's 3D rendering engine, which fills in the triangles with pixels. The 3D rendering engine must determine the color of each pixel according to the textures applied, the exterior lighting, and the properties of the materials depicted in the scene. The 3D rendering engine executes small programs called pixel shaders to make the necessary determinations about the color and texture of each pixel.

The Radeon 9700's 3D rendering engine is the first graphics processor that can render up to eight pixels simultaneously. The 3D rendering engine contains eight parallel pipelines, each containing its own texture unit and pixel shader engine. The eight pipelines

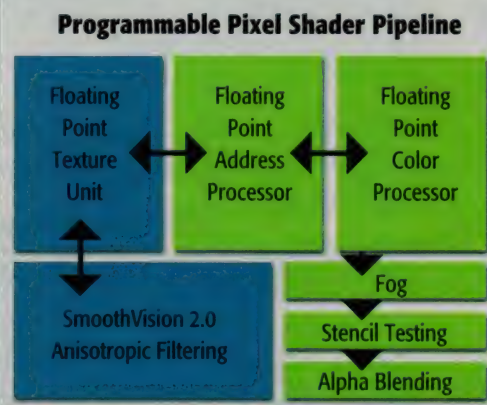
Radeon 9700 Architecture



Source: ATI



Within each pipeline, a 32-bit scalar processor handles scalar operations, while a 128-bit vector processor handles vector operations. The scalar processor and the vector processor can work simultaneously. After the scalar and vector processing, the data, when necessary, can undergo some additional processing steps within the pipeline.



Within each pipeline, pixel data and texture data enter different engines. The data can move through each of the three floating point engines if needed, receiving a different operation. As part of the floating point engines, the data can pass through anisotropic filtering, which improves the look of textures on each pixel. Finally, some special effect textures can be applied.

can process as many as 2.6 billion pixels per second.

Within each pipeline, the texture unit can sample as many as 16 textures in a single rendering pass. Depending on the quality of the scene that the programmer desires, the texture unit can handle 1D, 2D, or 3D textures.

The pixel shader engines in the 3D rendering engine pipelines meet DirectX 9 specifications, meaning they can handle floating-point operations. The use of floating-point operations provides increased precision—as many as 96 bits per calculation—over the integer operations used in earlier graphics chips. With their 96-bit precision, the Radeon 9700's pixel shader engines can generate cinema-quality graphical effects.

The pixel shader engine further improves its performance by simultaneously processing as many as three different types of operations at one time. Because pixel shaders often consist of each of the three types of operations—texture lookups, texture address operations, and color operations—the pixel shader engine has the potential to maximize its capabilities.

After the data moves through the 3D rendering engine, the chip uses SmoothVision 2.0 technology on the data, which applies anisotropic filtering and anti-aliasing.

Video processing engine.

The Radeon 9700 also contains advanced technologies for using the computer for playing and editing digital video. The video processing engine takes advantage of VideoShader and FullStream technologies and programmable pixel shaders to enhance the Radeon 9700's real-time video capture and video playback capabilities. The technology also can provide filtering techniques and noise removal for the digital video in real-time.

The use of FullStream technology gives the video processing engine the opportunity to greatly enhance several existing applications. For example, streaming Internet video usually isn't smooth; it often appears blocky. The

poor quality of the streaming video becomes even worse when it runs over a low-bandwidth connection. However, the video processing engine can filter out the blocky portions of the streaming video, leaving cleaner video results.

Within the video processing engine, VideoShader technology enhances DVD and TV playback and captured video segments with its noise filtering capabilities.

Final Step: The Output

Of course, all of the image enhancements included in the Radeon 9700 would be worthless without equivalent improvements in the method for outputting the graphical images. The Radeon 9700 contains several enhancements to its image output capabilities.

First, the channel frame buffer format offers 10 bits per color (as supported by DirectX 9). This format now supports more than 1 billion distinct colors, resulting in improved image quality. Previous formats supported eight bits per color.

Second, the Radeon 9700 offers two display controllers, letting the chip handle two independent displays showing different images. The two displays can run at different resolutions and different refresh rates, too. Finally, the chip's TV output encoder permits impressive resolutions of as much as 1,024 x 768.

Setting The Bar High

Obviously, the Radeon 9700 chip gives ATI a leg up in the industry. Many of its technologies are the most powerful the industry has ever seen among graphics chips. However, some analysts think the Radeon 9700's position at the top of the ladder might be short-lived. Some analysts expect NVIDIA's NV30 to at least match, and possibly surpass, the Radeon 9700 in several areas.

Regardless of how NVIDIA answers the challenge of the Radeon 9700, ATI's latest chip should remain a strong contender. Its various technologies and features are outstanding and groundbreaking. After all, there's something to be said for being first. **CPU**

by Kyle Schurman

BEAUTIFUL. IN A NAILS FOR BREAKFAST, WIPE

— SSR™: Available early 2003. —

Truck Trend dubbed it "the Grand Poobah™ of Cool."
Sounds about right.



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The Toronto Star said of our all-new midsize SUV,
"Whoa, this changes everything."



— SILVERADO™ HD: Available now. —

Looks can be deceiving. But not in this case.

chevy.com

*Prototype vehicle shown. †Limited availability. Please see your Chevy dealer for details.
Grand Poobah TM & © 2001 Hanna-Barbera. Chevy is a trademark of the GM Corp. © 2001 GM Corp. Buckle up, America!

YOUR NOSE WITH SANDPAPER KIND OF WAY.



— 2002 AVALANCHE[®]: Available now. —
The only vehicle that changes from an SUV to a pickup.
It adapts. But it never conforms.

Once again, wearing a bowtie is a bold statement.

CHEVY TRUCKS  **LIKE A ROCK**

TODAY'S HACKER:

HEAVENLY OR BOUND FOR HELL?

SPOTLIGHT CONTENTS:

Welcome To
DEF CON 0A 52

Black & White:
Hackers Wear
Many Hats 54

Hacker Tracking 56

Thwart Intruders
On Your PC 58

Imagine what would happen if you were head of the local PTA, active in your church's youth group, and helped teach kids at the Y," muses /dev/null, a white hat hacker and staff member at the popular hacking site Attrition.org. "One day the police get an anonymous tip that you're a key figure in an international child porn ring. They confiscate your computer, and there are tons of files of explicit photos. Your reputation is stained forever, even if you can prove in court that it wasn't you; it was someone who broke into your computer. So how bad can a hack get? Well, how bad can you imagine it getting?"

That's the hard news—the worst case scenario Hollywood, security products companies, and those who discuss the imminent cyberterrorist threat might have you believe is the norm in the world of hacking. The good news is that with a modest amount of precaution, small companies and everyday users are fairly safe from hackers.

"True hackers very, very rarely do damage," says John Klein, president of Rent-A-Hacker (www.rent-a-hacker.com). "They can write their own code and think

in creative ways that can't entirely be copied through training. Often, their goal is just to prove a theory."

If true hackers are the Van Goghs and Dalís of their trade, script kiddies are their back-alley, spray paint-wielding counterparts. These are generally bright but unmotivated teens that crave praise for defacing Web sites or launching minor DoS (denial of service) attacks on unsuspecting businesses.

So, should you worry about hackers or be asking them for help?

THE HACKER'S MIND

The meaning of "hacking" has drifted over the decades. In the '60s and '70s, student programmers at universities often had to reverse engineer code to continue their educations because no software alternatives were available. Today, "hacking" generally refers to unauthorized access to a computer or network. Because this tends to be illegal and sometimes destructive, hackers have been branded as dangerous miscreants little better than terrorists.

This sentiment is largely based on media hype and the general public's lack of technical understanding. Without

question, a large population of script kiddies hell-bent on causing damage exists, but far less frequent are the truly knowledgeable, seriously dangerous hackers who use their talents for revenge, embezzlement, or other nefarious ends.

At the opposite end of the spectrum are "white hat" hackers who abide by the law (in spirit at least), often selling their skills to public/private organizations to help guard against "black hat" hackers. Some prefer to use the terms "hackers" and "crackers." Hacker and open-source advocate Eric S. Raymond says, "Hackers build things; crackers break them."

"In essence, being a 'hacker' has a lot more to do with the mentality than it does how the mentality manifests itself," says /dev/null. "Franklin was a hacker. da Vinci was a hacker. That's what it's all about—the curiosity, the experimentation, the inquisitive mind, the creativity. Most of the older hackers I know don't frown on the younger hackers so much as they frown on the media portrayal of hackers and the proliferation of the obnoxious kiddies who can use point-and-drool tools to be destructive. That's not what hacking was all about, and I don't blame them for their frustration at all."

Can a once-mischievous young hacker be trusted as a responsible adult security expert? John Klein thinks so. He made Australian Kelvin "Mercs" Wong COO of Rent-A-Hacker. Wong started learning to hack in 1997 at 16. Klein says Wong's father was a traveling executive who often left his son unsupervised with powerful Sun computers and loads of available Internet bandwidth. Before long, Wong had hacked NASA, the U.S. Army, and the U.S. Department of Agriculture, landing himself on Uncle Sam's watch list.

"The first machine that I ever hacked was part of the Defense Information Systems Agency," says Wong. "I've always been curious about government/military sites. If you asked why, I really wouldn't know how to answer you. Perhaps it's the many American TV/movies we've seen on the topic of hacking. Maybe it's the quest for highly confidential files or high-profile sites. Back in 1997, security on gov/mil sites was shocking. A simple, common

HACKING ON CELLULOID

Hollywood loves a hack, but do mega-budget films do justice to hacking and cracking? We look at five of the biggest flicks in the field to find out.

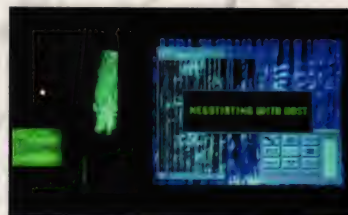
"Hackers" (thumbs down):

Not even Angelina Jolie's lips and occasionally witty dialogue saved this 1995 teen-cyberthriller from the ridiculous, nearly hallucinogenic depictions of server directories as skyscrapers and viruses as Pac-Men and rabbits munching on bytes of data. The movie gets points for drawing a line between well-intentioned vs. truly malicious hackers.



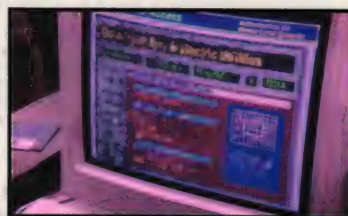
"Independence Day" (thumbs down):

Any alien race dumb enough to neglect installing a firewall against software viruses deserves to crash and burn. Then again, so does this ludicrous, 153-minute barrage of scale-model pyrotechnics. Apple missed the boat by not advertising its OS is wireless ETware-compatible.



"The Net" (thumbs down):

Should we take issue with a Whois lookup yielding someone's photo or the idea that one virus can melt any server system just by pressing the ESC key? (Note to bad guys: Run antivirus software.) The movie was, however, really the first major '90s flick to meld people's fears about network technology with general conspiracy paranoia.



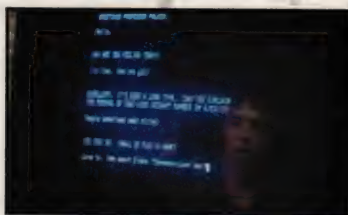
"Swordfish" (thumbs up):

Forget about Halle Berry (if you can). The critics hated "Swordfish," and Travolta's evil hipster performance is cringe-worthy. Nevertheless, Hugh Jackman makes a convincing former black hat, and the hacking technology—if you forgive the sculpture of flat panels at his workstation—is pretty respectable.



"WarGames" (thumbs up):

Could a phone-phreaking, grade-changing Matthew Broderick really hack the Pentagon and inadvertently launch World War III? In 1983, government computers were quite hackable, but not even the DoD would lump nuclear systems software in with a bunch of games. "WarGames" did pioneer the hacking subgenre on the silver screen, and in a campy way, it's still fun to watch.



HIGH ON CRACKZ

Why spend \$50 on the latest game or \$500 on a business app when you can snag it off the Web free? That seems to be what software pirates think when uploading/downloading files to/from specialized sites that typically fall under the term "warez," as in software(s).

According to the Business Software Alliance, piracy-related losses for the software industry totaled \$11 billion in 2001. Jason Allen, antipiracy investigator for the Interactive Digital Software Association, says pinpointing losses from illegal downloads vs. disc duplicating is difficult, but he estimates Internet-related losses in entertainment apps alone is "in the billions."

"We believe that the Internet piracy problem is the biggest growth area," says the BSA's Bob Kruger, vice president of enforcement. "Whatever the percentage of losses is attributable to piracy is today, it'll be a higher percentage tomorrow. It's a triple whammy: There are more people online, programs are easier and faster to download, and culprits are more difficult to identify and pursue."

Warez groups have their own subcultures based on content. "Appz" groups focus on applications, "gamez" on games, "serialz" and "crackz" on serial numbers and codes that can help unlock software, and so on. The BSA and other groups do a formidable job of knocking warez sites off the Web, but others spring up. Trying to find Web-based warez is likely to lead to dead links, porn-related pop ups, and wasted time. Most real-file transfers are done directly with FTP clients and IM apps.

Often, warez shows up online before retail versions hit store shelves. IDSA's Allen says prerelease "gold" copies are sometimes stolen or leaked by insiders or crackers occasionally pose as press reviewers to obtain advance copies. Money may be a factor, such as when the buyer is a large-scale disc duplicator. More often crackers are motivated by breaking software security and the ego boost of posting a new title first.

"Crackers will deconstruct the code of the game," says Allen, "and they'll look for the part of the code, almost like a chapter in a book, that deals with copy protection. They'll rewrite the book so that the copy protection is no longer included, and then they'll put it back together and republish it online."

Shutting down overseas warez operations can prove problematic, notes Kruger. Countries with low piracy rates often cooperate willingly, but countries such as Russia and China, where piracy rates are 87% and 92%, respectively, tend to be less cooperative. Kruger says several Southeast Asian nations are taking more active roles, however, perhaps because few IP-related companies will invest in an area where piracy goes unchecked.

U.S. sting operations occasionally capture high-profile crackers, but the offenders may not be the script kiddies you'd expect. The DrinkOrDie warez group made headlines last May when its leader, John "eriFleH" (HellFire spelled backward) Sankus Jr. was sentenced to 46 months in federal prison. Sankus and more than 40 other crackers were netted in the 14-month, U.S. Customs Service-run Operation Buccaneer.

exploit, downloadable on the Net, could be easily used to gain access and exploit the machine for full control (root/superuser access)."

Faced with turning 18 and being eligible to rot away in jail, Wong donned a white hat, became a security consultant, and ultimately wound up topping the roster of 300-plus freelancers at Rent-A-Hacker.

"Why do hackers hack?" asks John Klein. "Our company helped conduct a survey covering roughly a couple thousand hackers. We found that about 64% responded 'because they're bored.' Ask Kelvin why he decided to take up hacking and successfully hack the U.S. Department of Agriculture. The reason is because he had nothing better to do that day."

THE BEST DEFENSE

According to the Computer Emergency Research Team (www.cert.org) at Carnegie Mellon University, 401 hacking

**"HACKERS
build things;
CRACKERS
break them."**

- hacker and open source
advocate Eric S. Raymond



incidents were reported in 1991 vs. 52,658 in 2001. The first half of 2002 alone has yielded 43,136 incidents. About the best defense typical home users have is running at least one reputable antivirus program that's assiduously updated, a firewall (if not a hardware firewall via a router, then at least a software firewall), and, in extreme cases, unplugging from the Internet whenever possible.

The task is more difficult and expensive for businesses, but many companies have more to lose. Rent-A-Hacker markets to

small- and medium-sized businesses, with hourly prices starting at about \$170 to analyze weaknesses and suggest methods for patching them. That may be a bargain. /dev/null says his services once ran \$2,500 a day plus expenses working for a company where he was fairly "low on the totem pole." Other hackers at the same company were commanding as much as \$10,000 per day.

IBM's "ethical hackers" reportedly charge \$15,000 to \$45,000 for a single hack. This covers would-be attacks by a lone, relatively inexperienced hacker; a small team of experienced hackers; and a large team of determined experts. Asked if Big Blue is above seducing a client's janitor to complete a hack, Mike Bilger, global practice leader, IBM Security and Privacy Services, says it is up to the client to define the rules of engagement.

"We have done dumpster diving and other forms of social engineering, like being an imposter, gaining access to user IDs and passwords through the help desk and telephone centers—things like that. I mean, caller ID when you're sitting at the CIO's desk calling the help center can be a wonderful thing," Bilger says.

IBM trains its hackers from scratch, unlike some security consultancies. The ethical hacking effort started with recruits from IBM's research labs. It grew to include system administrators and college graduates. IBM trains them according to a rigorous and well-planned methodology.

"We will not hire ex-hackers," emphasizes Bilger. "We're not going to jeopardize our clients by bringing someone in that we don't feel comfortable with."

IBM takes this approach to earn the trust of its many Fortune 500-class clients. The military works similarly, using a blanket background check policy to deny anyone with a questionable hacking past. (Most government branches outside of the military do regularly employ hackers as consultants.) Klein says although you can teach a large amount of hacking academically, certain ingredients apply only to hackers who have honed their skills in real-life trenches.

"One of the key things you miss with training is the communication channels

**"TRUE
hackers very,
very RARELY
do damage."**

- John Klein,
president of Rent-A-Hacker



that hackers maintain," says Klein. "It's ever-changing and difficult to tap into. It's very hard to know what IRC channels to go to or what Web site to go to for information about what's really hot, right this moment. If you ask me what exploit is being used just within the last two days, I can tell you because I have guys who sit on IRC that are trusted by the hacker community because they're part of it and they know this information. But some guy sitting on a .gov address can't go flying into a hacker room and say, 'Hey, tell me what's hot!'"

ARE YOU A TARGET?

If a malicious hacker is interested in your system, he's probably setting it up to become a zombie for a future DoS attack. Your Quicken files or love letters just aren't worth his time. Businesses tend to be the real hack targets. This applies equally to the exploding world of wireless networking.

"Accessing a wireless network requires technical savvy and specialized tools," notes Linksys spokesperson Diana Ying. "But people make the hacker's job easier by not enabling WEP encryption or implementing MAC address filtering, which acts as a VIP list to lock out all unauthorized users on a wireless network. WEP isn't perfect, but it is a good deterrent, like a car alarm. The majority of wireless networks today still remain completely open, without WEP, just waiting for a hacker to drive by."

/dev/null says recommended security steps for consumers generally aren't good

enough. The hacker doesn't trust the abilities of antivirus companies to keep up with the latest threats. He advocates trusting common sense more than software.

"Good security requires diligence," says /dev/null, "but all security is a matter of acceptable risk. Decide what chance you're willing to take and tailor your security measures to suit it."

Make no mistake, hacking can be deadly serious for individuals and nations. Captured Al Qaeda computers indicated the terrorist organization was probing American public utilities and infrastructures, perhaps looking for weaknesses. Imagine if emergency water systems in Manhattan had been disabled Sept. 11, 2001. Perhaps white hats will be the firefighter-like heroes of possible future terrorist encounters.

It sounds like another Hollywood script, but the message about hacking is now positive. Hackers serve a valuable function, even black hats, because we can't afford to not take security seriously.

Most serious hackers want to help build a better, safer world. Ignore them at your own risk. **CPU**

by William Van Winkle

(To read our "Is Encryption Safe?" sidebar and our entire interviews with Kelvin Wong and /dev/null, go to www.smartcomputing.com/cpumag/oct02/hackcover)

WELCOME TO DEF CON 0A

(That's 10 in hexadecimal, yahoo.)

THE BANDWIDTH IS AS FREE AS THE INFO

(Editor's note: No Spotlight section on hacking would be complete without a trip to DEF CON, an annual convention that attracts hackers, IT professionals, and federal employees alike. Not to be left out, we sent staff writer Chad Denton to Las Vegas to check out this year's proceedings.)

While the general public was mindlessly feeding the throngs of slot machines, a large group of computer enthusiasts was assembling just a few blocks from the Las Vegas strip for the 10th annual DEF CON convention (www.defcon.org).

Held this year from Aug. 2 to Aug. 4 at the Alexis Park Resort, DEF CON can probably be best described as the antithesis of your typical computer show; the anti-COMDEX, if you will. There's no industry market-speak carried on at DEF CON. No spin and no buzzwords. In short, DEF CON is a refreshing change of pace.

Like Vegas, DEF CON attracts a wide variety of individuals. Some attendees choose to perpetuate the cyberpunk stereotype; others looked like they were trying to fit in with the crowd just a little too hard. Attendees ranged from kids who barely looked 16 years old to IT professionals to employees of the federal government.

Because so many DEF CON attendees value their privacy, members of the press were asked to be extremely careful when taking pictures or recording video of the show. Cameras were allowed in public areas, but press members were told to always respect the wishes of show goers. Audience shots were strictly prohibited in each session. In fact, one camera crew received a visit from the DEF CON Goons shortly after panning the crowd with its camera in one session.

Essentially, DEF CON is where hackers (and we use the term "hacker" in a positive way here) come to learn and share information with one another. As such, the various sessions that make up DEF CON are the heart of the show. Various tracks this year included Hacking/Phreaking 1.0.1, Privacy And Anonymity, Attacks/Tools, and Net Defense. An indoor theater and two temporary tents—one in the parking lot and one on top of the roof of the Alexis—were the sites of the tracks. Handwritten signs taped throughout Alexis Park directed you to each track. Every day at least one track got off schedule, creating some mild confusion among show goers, but considering all the activity that was happening, there were few complaints among those in attendance.

WHO LET IN THE LAWYERS?

There were a number of legally intensive discussions at this year's DEF CON, perhaps stemming from the arrest of Dmitry Sklyarov at last year's DEF CON. Or maybe there was simply a growing sense that the law is exerting a greater influence over technology.

Jennifer Granick of the Center for Internet and Society at Stanford Law School is well respected by the hacker community. Granick gave a speech about the USA PATRIOT Act (Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism Act). Granick also touched on a couple of other issues in her presentation, including Rep. Howard Berman's so-called "hack back bill."

Meanwhile, Joe Burton and William Reilly presented attendees with an update on the Elcomsoft case, which evolved from Sklyarov's arrest last year. For those familiar with the issues, there was little new information provided. Burton did express his belief, however, that the DMCA (Digital Millennium Copyright Act) wasn't a bad law, despite the fact that his client was being prosecuted under the 1998 act. Rather, Burton blamed the law's ambiguous ruling and a court system too eager to adopt broad interpretations of the DMCA.



Not everyone at DEF CON who gave legal advice was a lawyer. Len Sassaman provided would-be anonymous remailer admins various tips for dealing with law enforcement culled from his experiences running an anonymous remailer. One such tip: Don't post suspicious pictures on a Web site that shares the same domain as your remailer. Sassaman posted images of himself and his friends while target shooting in the desert. When local authorities received complaints of harassing email coming from Sassaman's remailer, they discovered his Web site. The pictures on his site did little to endear Sassaman to authorities.

NETWORK HACKS

Although legal discussions and practical advice maintained a periphery focus on computers and technology, other discussions at DEF CON placed technology front and center, including the Dreamcast phone home hack (see "The Dreamcast Phones Home" on page 59 for more.)

As Aaron Higbee and Chris Davis put it, most networks have a hard outer shell and a soft chewy inside (graphically illustrated with a picture of everyone's favorite wookiee surrounded by a protective outer shell). If you can gain physical access to the network, you can leave something behind, such as, oh, say a Dreamcast. The Dreamcast runs software that searches for a way to connect to the Internet (not usually too hard to find) and establishes a VPN connection with a remote PC.

The software also works on HP's iPAQ Pocket PC. Higbee and Davis also modified a version of Trinitix, which is a Linux distribution made to boot directly from removable media. They suggest burning the modified Trinitix distribution on a CD-RW shaped like Elvis and mass mailing them to a target company. When they arrive at the company, odds are someone there will put the

CD into his or her computer and boot it. Who can resist the King?

DEF CON HIJINKS

In some ways, DEF CON is a lot like going to school. You sit in on a session for 50 minutes or so, taking thorough notes, and then pack up and head to your next class. DEF CON even has its own dance: the Black & White ball. Held on Saturday night of the show, the Black & White ball has traditionally been a costume ball filled with the echoes of techno music and illuminated with a generous use of strobe lighting. We think we saw the BSD Daemon dancing in a corner, but, alas, Vegas appeared too hot for penguins.

If techno music isn't exactly your thing, there's always Hacker Jeopardy. Imagine the basic "Jeopardy" concept but with a hacker twist. Add in an R-rated Vanna White, known at DEF CON as Vanna Vinyl, factor in generous amounts of alcohol, and mix in an audience with the temperament of a professional wrestling crowd, and you'll start to get a good idea of what Hacker Jeopardy is all about. With categories such as "Microsoft Code Names," "Let's Torture Bill Gates," "Dr. Evil," and "WiFi," Hacker Jeopardy tests both a geek's technical and cultural knowledge, and then some.

The game consists of teams of three, and points are awarded in typical Jeopardy fashion. Before Final Jeopardy, however, 100 bonus points are added for each beer consumed during the game. The audience gets a chance to participate if none of the teams are able to answer the questions. Correct answers from the audience are awarded with a random prize. Hacker Jeopardy can get a bit racy. Suffice to say, nothing gets the crowd more excited than a Daily Double or

more upset than a cowardly wager or incorrect answer.

If you wanted to just chill out and maybe watch a movie, DEF CON was showing handpicked movies on Friday and Saturday nights. Movies included "Colossus: The Forbin Project," "Fight Club," "Dark Star," and, of course, "Blade Runner." Friday also featured a compilation of cool flash animations.

There's plenty to do during the day at DEF CON, as well. A scavenger hunt ran through noon on Sunday, and teams were asked to find miscellaneous objects throughout the city. Meanwhile, a different kind of scavenger hunt, called the First Annual DEF CON WarDriving Contest, took place on Saturday between 1 p.m. and 3 p.m. Despite a warning from the FBI, contestants found hundreds of wireless access points. The winning team, in fact, found 550 access points, 94 of which were open.

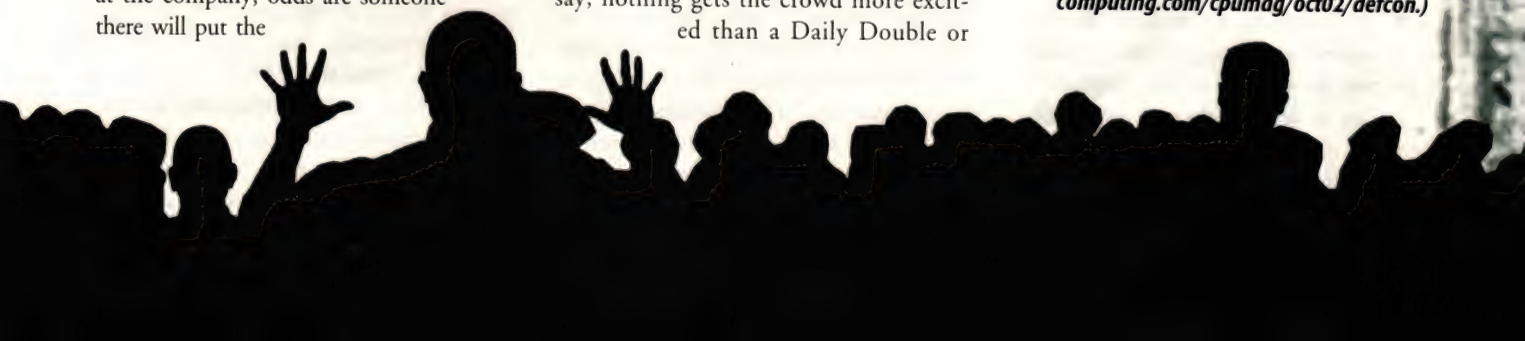
Finally, if you just wanted to kill some time between sessions, you could hop onto the open 802.11b network and access the Internet. The wireless network encompassed all of Alexis Park, letting attendees connect in their rooms, in the lobby, or poolside.

... BUT YOU CAN'T STAY HERE

Like all good things, DEF CON eventually had to come to an end. For those who haven't attended, we strongly recommend checking out DEF CON 11 when it rolls around next year. Think of it this way: For \$75, you get all the information you can handle, a wireless connection, and a chance to hang with some of the brightest people around. **CPU**

by Chad Denton

(For more on DEF CON, go to www.smartcomputing.com/cpumag/oct02/defcon.)



BLACK & WHITE

HACKERS WEAR MANY HATS!

Considering the mind-numbing complexity of computer hacking, it's ironic that this culture uses a simplistic nomenclature to describe itself: White Hat and Black Hat hackers, hackers with an eye toward improving security in a digital world and hackers hoping to exploit weaknesses in the system for their own gain or glory. The labels descend from silent film westerns, where heroes telegraphed their goodness by wearing white, and villains sparked an audience's hatred simply by donning black. But hacking is no horse opera. Lift the brim of these hats, and you are likely to see shades of gray.

WHITE HATS

These folks tend to be professionals or hobbyists who try to identify security flaws in a computer system with the aim of plugging holes rather than maliciously exploiting them. Many White Hats comprise security audit teams companies hire to test the integrity of an internal network or Web-based service by infiltrating them. In addition, application developers often must try to hack their own work in order to identify vulnerabilities within their own programs.

In fact, in order to do their job, White Hats such as Carla Steele, security architect for security firm Integralis, must act like Black Hats when they are hired to

troubleshoot a client's system. "When we get access to a network in an infiltration process, it's pretty much out-and-out war," says Steele. "We go for everything we can get and hold onto the information until we reach the reporting phase."

White Hatted system auditors not only look for how those on the outside might get in, but they also pay special attention to how insiders get sensitive information out. Employees accessing and passing on sensitive information remains one of the greatest security threats to a company, say experts. Even innocent workers are susceptible to the human hack, aka "social engineering," in which malicious hackers use persuasion or deception to discover details about an internal network in order to hack it more easily. Thus, White Hats spend a lot of time inside a company and its network in order to find both the technical and human weak points.

Some White Hats are hobbyists, or what Thubten Comerford, CEO of security firm White Hat Technologies, calls "purists . . . somebody who in his spare time does security testing on products he uses and then forwards that information free of charge to the manufacturer." The hallmarks of White Hat behavior are free and full disclosure of the problem to the system owner or software manufacturer and no malicious intent.

SHADES OF GRAY

The White Hats start looking a bit dingy as soon as they penetrate systems without the owner's permission, which technically is a crime. Often called Gray Hats, these are self-described do-gooders such as Tom Cervenka (aka "Blue Adept") who penetrated and publicized holes at eBay, Hotmail, and others but did no damage and sought no remuneration. Gray Hat Adrian Lamo achieved renown for hacking Microsoft databases, Excite@Home, Yahoo! content, and the internal news-gathering operations at *The New York Times*. He offered to help these companies fix the holes free of charge.

Some self-described White Hats inform the administrators of the hole by direct contact or more surreptitious means such as leaving an unmistakable "calling card" in the system, which alerts sysops that an unauthorized user has been there and a hole exists. Gray Hats such as Cervenka and Lamo raise questions about the purity of their motives because they often seek some kind of renown by publicizing the security flaws they find online or in the press.

Because the definitions are slippery, and the hacking field is rife with self-serving rationalizations about doing it all for the greater good of more secure computing, some experts such as Steve Branigan, vice president of engineering at Lumeta, don't buy the White Hat hacking label. "When an owner asks to be hacked, that's not hacking, that's a service," he says. He argues that by definition, hacking is an illegal activity: entering a system without permission. "It's not OK to go in someone's house through the window and then tell the owner, 'you should fix that window.'"

BLACK HATS

Although White Hat hackers may slip easily into shades of gray, there is little disagreement about what distinguishes a Black Hat hacker from the rest: malicious intent. Anyone who cracks into a system with the primary aim of doing damage to the network or personally enriching himself has indubitably joined the dark side.

Black Hats work in many and diverse ways. In recent years, they crashed high-profile sites such as eBay, Amazon.com, and MSNBC with denial of service attacks.

These attacks essentially use other computers to overwhelm the targeted sites with an unmanageable number of connection requests. Buffer overruns and The Ping of Death can also bring down servers, or even give total system control to a hacker, simply by sending oversized commands or information packets to a vulnerable IP address.

The worst of Black Hat activity involves theft and extortion. In 1994, a Moscow-based hacker gang tapped into Citibank's network and transferred \$10 million to themselves. Other criminal hacks involve downloading and holding for ransom a company's customer credit card records.

Some of the most famous Black Hats hacks are funny despite their criminality. Among the first and most famous hackers of all time, Kevin Poulson (aka Dark Dante) succeeded in hacking Pacific Bell's switching network in 1990 so that he could block out all competing callers to a Los Angeles radio station call-in contest. By making sure he was the 102nd caller, he won a Porsche . . . and, later, a prison term.

Black Hats like to sit on the information about security holes they find until they can put them together into a lucrative hack. According to Peter Chiu, security expert for IT consulting firm Infusion Development, these types of infiltrators "only report the vulnerabilities they find to fellow Black Hat hackers around the world."

Do Black Hats have any redeeming social value? Well, the ethics get a little messy here, but some people might applaud one emerging group of hackers who target pornographic sites for their mischief. And, in fact, the Black Hats often serve as unwitting teachers to the White Hat community of security professionals. According to Steele, "most of the good audit teams will have folks who are aliased in the underground communities looking for information. That is part of the game. That's how we get a lot of our information."

BLACK CAPS?

Although still decidedly on the dark side of hacking, a newer class of junior hackers,

dubbed "script kiddies" or "packet monkeys," is distinct from the Black Hats of old, who prided themselves in writing their own hacking programs and finding security vulnerabilities via their own knowledge of networks. Script kiddies do damage to sites by using the hacking utilities that are written by others and readily available online. These tools scan for open ports on Web-based networks or hack a library or school network and coordinate its PCs to deliver denial of service attacks against highly visible media sites.

Many feel that the rise of script kiddies represents the most serious threat to computer security because it demonstrates that bringing down a Web site or hacking a network no longer requires arcane computer knowledge. Because of the general availability of hacking utilities online, anyone with a grudge, a mean streak, or just slippery ethics is a simple download away from donning a black hat. **CPU**

by Steve Smith

WHICH HAT WOULD YOU WEAR?

Black Hat and White Hat hackers often look in the same places and use the same tools to expose security flaws. The big difference is in how each hacker group is likely to respond to the same situation. Here are some examples.

Situation	White Hats Would . . .	Black Hats Would . . .
Using a packet sniffer, which is a utility that can read the contents of all packets of information that are passed along the network	use it as a diagnostic tool to identify faults in the network or even to detect hacker intrusions.	use it to read sensitive data going across a network, especially passwords that can then be used to hack into the most private information.
Finding a hole in an ecommerce site that exposes customers' credit card information	inform the company of the vulnerability or, in the case of a Gray Hat, publicize the security weakness.	extort the company, threatening to place the database online unless the hacker is paid a fee.
Penetrating a corporation's proprietary research and development records	do nothing or download the data out of curiosity.	look for source code to pirate or proprietary information with which to extort the company.
Finding a way to change content on a Web site	inform the system administrator or leave a harmless "calling card" to alert IT of the vulnerability.	deface the site or alter content.
Discovering a worm or virus	report it to the CERT Coordination Center, the security and virus clearinghouse organization.	try to infect a specific company network, usually for revenge, or augment the worm to make its detection and cure even more difficult.
Penetrating a home PC via a modem or broadband connection	notify the ISP of the vulnerability.	search the user's PC for passwords or credit card and financial data to use elsewhere or use the PC as a "zombie," a launch pad for attacking a network.

HACKER TRACKING

LINES BLUR AS LAW ENFORCEMENT STEPS UP ITS EFFORTS

In the year following the terrorist attacks of 2001 against the United States, law enforcement officials have improved their ability to catch hackers in the form of federal laws providing new powers of surveillance. One example is the the USA PATRIOT Act, which gave federal investigators expanded powers for surveillance, with a focus on preventing terrorism.

MITNICK'S STORY

Some law enforcement officials don't think the USA PATRIOT Act goes far enough in giving them the edge they need to track down terrorists. Others fear the new law has the potential for setting dangerous precedents that could lead to an erosion of personal rights.

Another problem some people have with the USA PATRIOT Act involves its lack of focus. Although the act is supposed to focus on terrorism, critics wonder who will define terrorism as it applies to the act. In perhaps the most famous criminal case involving hacking in the United States, Kevin Mitnick was arrested in 1995 and jailed—some would say unjustly—for hacking into

several computer systems. At the time of his arrest, officials at the U.S. Department of Justice were quoted calling Mitnick "a computer terrorist."

A terrorist? Even though Mitnick wouldn't fit the 2002 definition of a terrorist in the eyes of most Americans, Mitnick himself wonders how law enforcement officials will define the word "terrorist" as they look to justify using the Patriot Act. "The Department of Justice uses the word 'terrorism' loosely," Mitnick says. "I'm going to feel really bad for the next person they make into an example."

Mitnick, 39, has lived through a case where he says law enforcement didn't follow the proper legal procedures when tracking and arresting him. "I won the scapegoat sweepstakes," he says. In February 1995, FBI agents arrested Mitnick in Raleigh, N.C., after a nationwide manhunt that lasted three years. Computer security expert

Tsutomu Shimomura aided the FBI in tracking Mitnick, after Mitnick allegedly hacked some of Shimomura's personal files.

The trace. Shimomura used electronic surveillance devices to monitor Mitnick's computer activities and eventually pinpoint Mitnick's location. The FBI then arrested Mitnick, who says Shimomura illegally shared the information he had gathered with the FBI. Mitnick says that because Shimomura was working as an agent of the FBI, he needed to obtain a court order before performing any surveillance on Mitnick's activities. (Officials at the FBI and DOJ declined and didn't respond to several different interview requests for this story.)

"That's one of the many issues in my case," Mitnick says. "The government played a lot of dirty tricks and violated at least the ECPA (Electronic Communications Privacy Act)."

After his arrest, Mitnick spent 49 months in prison, during which he never received a bail hearing. Mitnick says prosecutors were seeking to make an example of him as a deterrent to other hackers. "I've never made a dime on hacking," he says. "I just had a curiosity."

In March 2000, Mitnick eventually pleaded guilty to nine charges—eight of which he later said he did not commit—dealing with fraud convictions related to hacking into computer systems at several companies, including Sun, Novell, and Motorola. He served a few more months of prison time before his release in January 2000.

Mitnick still serves a supervised release, where he is not allowed to use a computer or act as a consultant in

computer-related matters, which is scheduled to end Jan. 20, 2003.

A CHANGED MAN?

Within the next few months, Kevin Mitnick probably will be able to legally sit at a computer keyboard for the first time in several years. Although that will scare some people, Mitnick says he's reformed and ready to use his knowledge to help society.

Mitnick and a partner are preparing to start a company that focuses on helping companies improve their computer security and network defenses. "We're trying to help companies ramp up their training programs," Mitnick says.

He's also written a book called "The Art of Deception: Controlling the Human Element of Security," scheduled to be published Oct. 4, 2002. It provides advice on computer security, as well as real-life examples of how hackers can exploit network security.

Mitnick says he hasn't yet encountered much skepticism about his claims of reform, but he expects he will once word about his book and business venture begin to spread. "I'm sure I'll get my share of critics," he says. "I've made some extremely poor judgments [in the past]. . . . I want to be an asset to the community."

He says one group who will be especially skeptical of his reformed ways—the FBI—certainly will be keeping an eye on him after his supervised release ends in January 2003. "I have no doubt they'll be watching," he says.

UNLIKELY SUPPORTER

Mitnick's case made him a hero among many segments of the computing world, especially in the world of hackers. The Web site for *2600: The Hacker Quarterly* continues to display a "Free Kevin" banner, showing support for Mitnick. The government's handling of the case made many other computer professionals profess support for Mitnick,

too. "I think that what Mitnick did was wrong," says Chris Davis, head of R&D at Kago, an Ottawa-based Internet and network security company. "I think that he should've been caught, absolutely. That's where my agreement with the whole situation ends. I think that what the U.S. government did to hold him, and what they attempted to charge him with was completely asinine."

"I think that he honestly was done a great injustice, even though he did break the law. I think that what happened to him was, I don't know, I can't even come up with the words for it. . . . I think that 30 years from now, maybe 40 years from now, once people have a greater understanding of the Internet and computers and the way that a wired world works, they'll look at that [case] and just shake their heads," Davis says.

A self-taught computer expert, Davis still calls himself a hacker but has worked with law enforcement officials around the world on hacking cases and other types of cyber crime. Davis was involved in tracking down Raphael Gray, known as Curador, after a 2000 hacking spree in which Gray stole more than 25,000 credit card numbers from ecommerce sites.

Uneven battle. Davis, who says he's aided officials in a few other cyber crime cases after helping track down Gray, says most law enforcement departments in 2000 were ill-equipped to investigate and solve computer crimes. "I think [FBI agents] have improved from where they were two years ago, absolutely," he says. "The people that I worked with from the FBI on the Curador case were smart people, really sharp, really good. They just weren't really skilled or experienced in the forensics or cyber crime area. They just sort of ended up with it on their laps because they were of this one jurisdiction where this one crime occurred."

He says law enforcement officials still are working at a severe disadvantage compared to the hackers, though, and this probably won't change any time

soon. "[A hacker who discovers a security hole] keeps it to himself and trades it among his other black hat friends," Davis says. "Law enforcement has no clue. Suddenly, they're breaking into servers all over the place, and law enforcement has no idea how it's occurring or how to prevent it. That is generally, in my opinion, how the bad guys are going to stay ahead."

FINDING A BALANCE

Law enforcement officials continue working to find a balance between stopping cyber crime and not stepping on privacy rights. Sens. John Edwards (N.C.) and Charles Schumer (N.Y.) recently called for a commission that would examine how new surveillance technologies are affecting personal privacy. "Post 9-11, we have recognized greater security risks," says a Sen. Edwards staffer. "Law enforcement needs new authorities, but we don't want to step on individual rights unnecessarily."

Davis says the terrorist acts of Sept. 11 are strongly responsible for the heavy-handedness of new surveillance and hacking laws. "What happened on 9-11 scared the hell out of everybody," Davis says. "It's like a pendulum. You don't have enough in the way of law, and then something bad happens, and you swing way over the other way and create this state of fear and paranoia. . . . It's going to find the middle, eventually, hopefully. As long as we have smart people in power, it should find that middle ground and everything should be OK. Currently, it's swung the other way, from what I'm seeing. That's what scares me." **CPU**

by Kyle Schurman

For the full version of this article, see www.smartcomputing.com/cpumag/oct02/hackertracking.

THWART INTRUDERS On Your PC

PLUG THE HOLES HACKERS LOOK FOR

According to the experts, it only takes an ounce of prevention to discourage hackers from tinkering with your system because of the way they work and what they are after. Part of that prevention is understanding what hackers are looking for. Most hackers aren't all that interested in your personal email and confidential data. Of course, there are hackers who are petty thieves in search of credit card or bank account numbers or simple vandals who want to trash your desktop just because they can. But in most cases, a hacker wants access to a personal PC in order to use it, either as part of a coordinated attack from many similar hijacked PCs toward a third-party system (denial of service attacks) or as a disguise, a means of hacking onto other systems under your identity. One compelling reason for protecting your PC from these sorts of hijackings is that you can be held legally and financially liable for damage done through your computer, warns Thubten Comerford, CEO, White Hat Technologies.

The fact of the matter is, most hackers are not interested in your specific PC so much as they are interested in gaining control of any available PC. As a result,

even rudimentary security measures, using a router or activating password protection, often are enough to make these system burglars pass on to the next house. They are more likely to look for the first open window in a neighborhood than bother circumventing an alarm system. By understanding the most likely vulnerabilities on your PC and taking basic security measures, you can keep all but the most ambitious PC crooks at bay.

THE HUMAN HOLE

Stop blaming Microsoft, the Web, or insecure software because many experts point to you and I as the biggest, most easily exploited security hole for hackers. According to John Chirillo, author of "Hack Attacks



Revealed" and "Hack Attacks Denied," weak passwords or the failure to use the security that is already built in to hardware and software are among the greatest system vulnerabilities. "Some systems and applications by default include accounts that either contain no passwords or require password input without strict regulation or guidelines."

If people are serious about security, he thinks they should make a habit of encrypting any data they transfer over a network or the Internet. And because hackers can use password-cracking software on a system to run through random username and password combinations, he recommends always changing both elements from their default settings, as well as combining letters and numbers for both elements because these are tougher to crack.

"Social engineering," the dark art of persuading a person to reveal sensitive information that could be used to access your machine (such as an IP address, credit card numbers, and account passwords), is still the easiest and most common hack of all. One common route is the fake virus alert: spamming users about a new viral threat and then getting them to fork over credit card info in order to buy the nonexistent cure. Callers and email correspondents posing as system administrators or employees with your ISP are other common methods of prying passwords from users. Chirillo advises, "Just say 'No!' Don't ever reveal personal information."

OPEN WINDOWS

There are a ton of Windows defaults that hackers can easily exploit. Far and away the biggest gaping hole in most systems is file sharing. Many versions of Windows automatically configure network drivers to share access to a printer, a shared documents folders, or even an entire drive. Virtually all security experts say this is the most vulnerable point in the Windows operating system because it essentially invites any hacker who gains access anywhere on the network to

explore your machine. The first defense for a Windows machine is to turn these share properties off altogether if they are not necessary. Otherwise, get in the habit of switching them on only when you need them.

Yet another hole is the guest account, which lets you log into Windows itself or many Microsoft programs without a username and password. While entry through a "guest" login usually gives a hacker only limited access to the system, the hacker can use this access to open up bigger holes in the password-protected areas. It is a good idea to turn the guest account off entirely via the User Accounts folder in the Control Panel.

Virtually any part of the Windows OS that communicates with the Internet is a potential security threat that also opens the door to other aspects of the system. For instance, in June, Microsoft announced a "critical" security flaw in its ubiquitous Media Player (including versions 6.4, 7.1, and XP). When the player calls up certain types of copyrighted, digitally protected media files, it exposes to the connected server the location of that PC's Internet Explorer cache files. With this knowledge, a hacker can plant all sorts of remote controlled programs within the IE cache directory and literally take over the PC. Microsoft issued an immediate patch, but this is a good example of how even a security pinprick in any single part of a highly integrated operating system such as Windows can be exploited throughout the PC. There was no recorded instance of anyone exploiting this hole, but it is precisely the kind of security weakness minutiae that hackers stockpile and later assemble into hacks.

THE COMBINED THREAT

Forget firewalls, routers, and passwords keeping stealthy cyber snoops out. It is the material that you willingly let into your PC that poses the most immediate threat. Email clients are widely known as common entry points for viruses and worms, but hackers are now starting to use this point of entry to

THE DREAMCAST PHONE'S HOME



Doh! Just when you traded in that obsolete and orphaned Sega Dreamcast game console at Electronics Boutique for that new Xbox, it turns out that Sonic the Hedgehog's favorite platform could be used as a high-tech spy. At the recent DEF CON security conference, two white hat hackers demonstrated how the DC, fitted with the Linux OS and a network adapter, can be dropped into an office space and connected to any open network port on a PC. The console is programmed to seek an open channel in the network out to the Internet and "phone home," or connect to the hacker. This is one way a hacker can locate an available tunnel through a corporate firewall and enter a system. Why a Dreamcast? Well, it is cheap, has a network card, and looks too much like a toy to raise suspicion. Sonic a spy? Nah!

plant Trojan horses, programs that can wrest control of your PC.

In the highly popular Microsoft Outlook client, for example, the main weakness is otherwise considered a feature: the program's ability to run attached Visual Basic scripts and to accept documents, which in turn can contain virus-infected macros that are activated when the attachment is opened. Microsoft has issued multiple updates addressing these problems in Outlook. Most virus-protection programs now include email watchers, which scan emails and attachments for known intruders. Of course, keeping both the email client and the antivirus software

updated to recognize the latest threats is absolutely critical to safety. More to the point, don't forget to turn on the email monitoring feature, which often is not installed or activated by default.

ALWAYS ON. ALWAYS HACKABLE

The quick growth in home broadband connections has been a windfall for hackers. A leading culprit is the static IP address. Some high-speed access ISPs still assign each customer a permanent IP address with which he logs onto the 'Net all the time. For hackers who are always sniffing for unprotected machines plugged into the Internet, this is nirvana. A static IP address gives an intruder a permanent, reliable place from which to wreak havoc or launch attacks on others.

The first obvious line of defense for those who have static IP addresses is to shut the machine down when it isn't in use. If the machine becomes unreliable to an intruder, especially during the late-night hours, it is likely he will move on to the next victim. Also, many broadband ISPs are in flux, moving from static to dynamic IP addresses, which assigns a different IP address to the user each time he logs on, making it harder for a hacker to make your PC his permanent home. Try asking your ISP to switch over to a dynamic IP address.

One of the best lines of defense is to get a broadband router/gateway, even if you are not planning to run the connection to multiple machines. The router is itself a computer that constitutes the only IP address that can be seen from the Internet host and by hackers. The router translates traffic from the Web to the internal IP addresses that your local PCs use to connect to the router. If the unit is configured properly, the outside world should not be able to see these connected PCs at all, and so the router forms a natural firewall against hacking.

As with all antihacker protection strategies, the one caveat is configuration. Almost all routers come with a default username of "admin" and a blank password. Many users leave this as is, which can give a hacker access to the router and

its configuration, including the internal addresses of your network. First and foremost, a new router owner should give the unit a discrete name and password.

HOLES IN THE FIREWALL?

One of the problems with a PC is that it has literally thousands of points through which a hacker can latch onto your system. "There are 65,535 ports on a computer," says Chirillo. "An attacker can use discovery or initial 'footprinting' or information gathering to detect which of these ports is active and listening for requests. This can facilitate a plan that leads to a successful attack." A personal firewall is the best overall protection from this sort of "port scanning" because it helps lock down many of these ports and allows only authorized and necessary

they cannot be hacked, and can even protect against Web page scripts that can enter and corrupt your computer simply as a result of your surfing to a Web page. At the same time, firewalls let you share files and make network connections with predesignated, trusted partners.

The main vulnerability of firewalls is user misconfiguration and lax updating, says Branigan. Most of all, users need to understand that a firewall is not especially smart. "It doesn't screen what you allow in. That leaves content vulnerabilities. I may have a firewall and allow email, and the firewall will never stop the virus," he says. Likewise, your firewall may be configured to overlook an instant messaging or file-sharing client that is allowing others to contact your PC. You need to be especially careful

HISTORY'S GREATEST HACKS

In the annals of high-tech skullduggery, there are hacks and then there are HACKS: security breaches that are so audacious, ambitious, or just plain funny, they will always be remembered as milestones of the dark art.

1972. In this notorious use of low-tech to crack high-tech, John T. Draper found that a prize whistle being distributed in boxes of Cap'n Crunch cereal worked at just the right frequency on a pay phone to give him authorization for free long distance calls. Known as "Cap'n Crunch," Draper created devices that could do the same thing for others.

1990. Kevin Poulson (aka Dark Dante), now a journalist specializing in security reporting, hacks a phone company so he is the only one able to call into a radio call-in contest.

processes to come in and out of a system, "With a firewall you are cutting out a lot of bad traffic," says Steve Branigan, vice president of engineering, Lumeta.

When properly configured, a good firewall will keep much of your computer in stealth mode, making it invisible on the Internet. It is also one of the better ways to keep the insecure parts of your computer locked down while still allowing for relatively unhindered use of the Internet and internal networks. Firewalls monitor and log attempts to access your computer, block inactive ports so that

about which programs that firewall lets act as "servers," programs that permit outside programs to connect to them.

Firewalls also can be fooled into admitting protocols and data packets you thought were being filtered out into your system. The process is called "protocol tunneling," a hack that hides a destructive or unwelcome protocol inside one that is permitted, such as the HTTP protocol used to communicate with the Web or the SMTP protocol for sending email. Because most firewalls are configured to allow these most common modes of

Internet use, the firewall will permit a disguised activity through, thinking it is just another call from a Web page. In this case, the best defense comes behind the firewall, from operating system and software program defenses that resist these destructive protocols once they emerge through the firewall and reveal their true identities when they go into action.

DEATH BY COOKIES

Go ahead and shut down all available ports, file sharing, or even email attachments. Every time you communicate with a Web site, you may be opening vital information for prying eyes to see, either through cookies or a Web site's own JavaScript routines. According to Chirillo, cookies and Java can be used to scavenge everything from your POP

let you monitor cookie placement and accept or reject cookies as different Web sites attempt to plant them.

BATTLING WAR DRIVERS

The proliferation of home and office 802.11b (Wi-Fi) wireless networks brings the war against hacking literally into the streets. It is called "war driving," a hacker and a notebook in a car using a scanner to detect any wireless signals that bleed onto the street either from home networks or office buildings. Both the Wi-Fi protocol and its common configuration on many machines make it easy pickings. The default installation for most wireless access points and NICs uses Channel 6, an SSID name of "default" without password protection, communicates

trying to figure out the ID of your wireless network, a war driver will ask, when there are more than enough networks just around the corner named "default"?

ETERNAL VIGILANCE

Hackers are always on the prowl for bits and pieces of information about software and OS vulnerabilities, often hoarding them for the day they can put them together into a masterful attack strategy. Likewise, security experts are always test-hacking software themselves to identify possible weaknesses and also monitoring the underground (See "Black & White" on page 54 of this issue) for word of potential threats.

The result is that manufacturers are regularly updating operating systems, browsers, email clients, antivirus

1990 to 1994. The "Great Hacker Wars" erupt between two hacking gangs, the LOD (Legion of Doom) and its spin-off, the MOD (Masters of Deception), each trying to out-hack the other. Victims included phone companies, the National Security Agency, and credit-record company TRW, where credit histories of celebrities and the rich were exposed. Many of the leaders are arrested in the first hacker sting in 1993, and MOD leader Mark Abene (Phiber Optik) serves a 13-month jail sentence.

1995. Russian hacker Vladimir Levin and accomplices tricked Citibank computers into distributing \$10 million into the thieves' accounts.

Perhaps the most famous hacker of them all, and the first to be among the FBI's Most Wanted, is Kevin Mitnick (aka Condor). After being arrested once in the '80s for stealing secure information from DEC, he was nabbed again for a spree of hacking into credit card databases, a DMV, and phone switching networks. In classic '90s fashion, he went to prison and emerged a marketable celebrity, host of a radio show.

1996. Fired Omega Engineering employee engineer Timothy Lloyd gets revenge on this major Navy and NASA contractor with six lines of code that crash the manufacturing operations system, causing an estimated \$10 to \$12 million in damage.

2000. The year of the denial of service attacks, which brought down Yahoo!, eBay, CNN, Amazon.com, ZDNet, E*TRADE and Excite. A 16-year-old Canadian ("Mafiaboy") was convicted of staging some of these assaults.

location to your IP address and your email address. So what? Well, this is the sort of initial information hackers love to use to exploit in order to start scanning your ports for backdoor access or just initiate a social engineering hack, a persuasive email that will lure you into opening your machine's security up even more or plant a Trojan horse.

Disabling cookies altogether is the best defense, as is making the browser prompt you before running a site's JavaScript. Cookie managers, available from many antivirus program vendors,

without encryption. Few users ever change these settings, so pretty much anyone with a Wi-Fi card nearby can either vagabond on your broadband connection or, worse, gain access to PCs on the network.

Two simple steps will make most war drivers pass by in search of another connection. First, from your wireless NICs and access point, turn encryption on. Moreover, give the network a discrete SSID. As with passwords, use something uncommon and mix letters and numbers to thwart easy hacking. Why bother

software, and firewalls to plug the holes as they are revealed. But because human systems are at least as flawed as mechanical ones, we usually forget to keep software updated. In many cases, hackers access corporate and personal systems via holes that are widely known and even well patched by recent software updates. In other words, keep all of the pieces of your PC software and operating system suite current if you want to discourage the easy hacks. **CPU**

by Steve Smith

The Bleeding Edge Of Software

by Warren Ernst

Inside The World Of Betas

Fortune-telling becomes an exact science when it comes to working with betas. This month we bring you four glimpses into the future of software.

XDESK 3.92.893 Beta

If using multiple monitors appeals to you but you lack the space and funds, a multiple-desktop utility is the next best thing. There are many, but XDESK is about the most feature-filled I've seen. If you run WinNT/2000/XP, this may be your desktop dream. Win95/98/Me users may want to keep looking.

XDESK lets you switch between desktops via hotkeys, System Tray icons, and a window containing your desktops in miniature form. You can also "bang" the mouse pointer against the screen's edge. Other multiple-desktop-related features include various desktop icon placements on each desktop, wallpaper management, and a hook into the Task Manager to indicate which desktop contains which app.

Most similar apps stop here. Not XDESK. One extra is an AppBar; it displays tiny icons of apps you can start with a click. You can auto-hide the bar against any edge and display submenus for running tasks and Control Panel applets. Hot Corner can automatically turn on a screen saver, always keep it off, and other tricks. There's also a CPU monitor, memory cleaner, and pop-up task reminder.

If there's a negative, it's that XDESK takes up more resources for Win95/98/Me users than it should. Because the app encourages you to run as many other programs as you can, this can lead to system instability. In WinNT/2000/XP environments, however, XDESK is a great tool for increasing productivity. ▲

Official product name: XDESK
Version # previewed: 3.92.893 Beta
Publisher: XDESK Software
Developer and URL: XDESK Software;
www.xdesksoftware.com
ETA: Q3 2002

Why you should care: When multiple monitors aren't realistic, this software is the way to go.

CDSurf Professional Beta 1.15f

Though CD burners make backing up files a dream compared to the days of floppies and Colorado tapes, there's still the problem of locating files when you need them. When you consider all your MP3s, AVI movies, and other multimedia on CDs, retrieving a specific file can be tricky.

CDSurf takes a giant step forward for organization. First, have CDSurf scan your CDs. In about 10 seconds per disc, CDSurf stores a catalog of every filename on the CD. It then

indexes by genre, disc name, and filename.

Then, suppose you want a specific file. Fire up CDSurf, type the file name or other file attributes, and let CDSurf tell you which disc the file is on. A future CDSurf beta will prompt you to insert the disc and copy the file to your hard drive. For now, it's up to you to copy the file manually.

Though the interface is attractive, it doesn't exactly promote easy workflow. For example, you can't search for a file across disc categories. So for now, the best thing isn't to categorize your discs at all. Still,

within these confines, CDSurf works well and is a real time-saver in some circumstances. If you have a large collection of discs, it's worth a look. ▲

Official product name: CDSurf Professional
Version # previewed: Beta 1.15f
Publisher: MindAlpha
Developer and URL: MindAlpha; www.cdsurf.net
ETA: Q3 2002
Why you should care: If you have a lot of CDs to keep track of, this is the way.

HiDialer 2000 3.0 Pre-Release 921

There are a lot of hassles using a modem to connect to the Internet, and that's not even mentioning speed. Dial up. Hang up. Dead modems. Busy signals. Disconnections. And if you pay by the minute or megabyte, tracking the charges can be a pure guessing game. HiDialer 2000 handles all of this, plus a few more problems.

HiDialer's primary goal is to dial your modem and connect to the Internet, but it can use all your DUN icons or settings sequentially. In other words, if you have five different DUN icons for your ISP and each has the same login name and password but different telephone numbers (inside or outside your local area code), HiDialer will dial through the list if any entry is busy, out of service, or connects too slowly for you. This feature should have been built into Windows.

Once HiDialer connects, it can automatically launch one or more apps, such as your browser, emailer, or instant messenger. It can also close them when you disconnect. In addition, the app can automatically

track actual connection speeds, and if a speed drops below a certain level, hang up and dial again. Alternately, it can continually ping a server (usually one your ISP owns), and if that fails, redial another connection. HiDialer will perform a similar trick to maintain a “keep alive” connection.

The app has its own built-in schedule so it can connect/disconnect at a given time, which is perfect for updating antivirus programs or downloading a day's worth of Usenet posts. HiDialer can automatically synchronize your system clock with a time server, too, plus log your online time and the data it transfers to check your per-minute or per-megabyte charges by giving you a running total of your online charges.

The beta has some kinks, but HiDialer's functionality makes this a keeper, even though it isn't free (\$26.95). If you have to use a modem, this program is for you. ▲



Official product name: HiDialer 2000
Version # previewed: 3.0 Pre-Release 921
Publisher: K & G Software Group
Developer and URL: K & G Software Group; www.hidialer2000.com
ETA: Q3 2002

Why you should you care: There's no better way to manage a dial-up account than this.



Official product name: LeechGet 2002
Version # previewed: 1.0 RC2
Publisher: Martin Albiez
Developer and URL: Martin Albiez;
www.leechget.de
ETA: Q3 2002
Why you should care: The best free software downloader and FTP client you'll find.

LeechGet 2002 1.0 RC 2

You'll search a long time before finding a download-management program as feature-packed, attractive, and friendly to use as LeechGet 2002. Plus, it's free.

First and foremost, LeechGet is a download assistant for Web browsers. It can check if a server can support multithreaded downloads and then initiate faster downloads most of the time. It can also auto-resume an interrupted download, automatically disconnect your dial-up modem once it finishes, and look for different sources if necessary.

LeechGet automatically integrates (to varying degrees) with Internet Explorer. With IE6, LeechGet automatically captures mouse clicks that result in a file download; with IE5 and 5.5, it adds a Retrieve Files with Leech-

Get item to the right-mouse context menu. Opera and Mozilla users can enjoy the same integration with plug-ins, and they work well. You can also copy and paste a download URL directly into LeechGet, tell it to monitor the clipboard for download URLs, and drag a download link to the

LeechGet window or floating download now icon. The app is nothing if not flexible.

LeechGet is also a full-featured FTP client, combining the classic dual-pane remote folder/local folder GUI of WS_FTP and the drag-and-drop abilities of CuteFTP and others. LeechGet supports nearly all the arcane FTP settings needed to get through firewalls and keep track of login/password combos.

Finally, LeechGet is a "Web site sucker," capable of retrieving all the HTML, graphic, and script files direct from a Web server; just give it a URL and choose the files you want from a list. It's up to you, however, to navigate directories on the remote site.

LeechGet's authors paid special attention to its look and feel, making it appear to be right out of WinXP, even on a Win98 machine. The interface looks like Outlook or FrontPage, with icons down the left side and different stacked panes of folders and files on the right. Even the complete Help file looks like Microsoft wrote it.

No matter how you slice it, LeechGet is a great program at a great price and is worth a download immediately. ▲

Send Us Your Betas

Know of software in the beta stage that's deserving of some attention? Let us know. We'll take a look at it and possibly give it a go-around. Send your prospects to bleedingedge@cpumag.com.

Mozilla 1.0



Mozilla 1.0

Free

The Mozilla Organization

www.mozilla.org



Let's get this out of the way: Mozilla 1.0 is a stable, reliable browser you should check out immediately. It renders pages more robustly and reliably than Opera 6, offers more features and options than Internet Explorer 5.5 and 6, and is less intrusive and beholden to advertisers than Netscape 6 or 7. Mozilla may not be the best browser available, but it's good enough that if you're only using one

browser now, you should be using two.

Mozilla 1.0 combines a browser, email client, newsreader, HTML editor, IRC chat client, and JavaScript debugger. Each is fully skinnable and shares code modules with the others. The components use relatively few system resources, but each utilizes its own application and preferences windows, making them feel like standalone apps.

Mozilla 1.0's core app is the browser, and the Gecko rendering engine quickly lays out Web pages pretty well. Where Opera 6 occasionally hiccups on Web pages, Mozilla does fine. (This may be because Mozilla/Netscape is the Internet's unofficial secondary browser, and Webmasters actually test their pages with Mozilla.)

After 10 minutes with Mozilla, you'll ask, "Why didn't Microsoft do that?" Opera users will say, "Close, but no cigar." Either way, Mozilla is a big step up from the Netscape you remember. Tabs is the best feature, letting you view multiple Web pages in a single browser window.

Sidebar is an extra frame of browsing tools that includes a library of sidebars, such as Google Searches, MapQuest maps, and CNN articles. The password-management routines are also more reliable and easier to edit than other browsers'. Other features seem less developed than Opera's or too developed for their own good. Form Manager, which automatically fills in Web page forms, is one example.

Mozilla's other features include a dialog box to enable and disable several JavaScript annoyances (more so than Opera/IE). These settings

are buried, however. Opera's similar features aren't as extensive, but changing them is a breeze. Many of Mozilla's features repeat this trend. IE users will be thrilled. Opera users may miss the simplicity but enjoy the extras.

Mozilla's email and Usenet newsreader module, called Mail/News, is a worthwhile program that equals Outlook Express in most areas and blows Opera's out of the water. Mozilla can easily handle checking mail from several servers at once without monkeying around with multiple-user profiles. Sending mail via any profile is simple, too. Each user/server combination gets its own Inbox and other folders, however. If you prefer a common Inbox for all your mail on all your servers, be prepared to create a filter.

Other enhanced features approach those of Eudora's. You can color-code messages for later sorting, and Mail/News can track all addresses you receive/send mail to/from, keeping them in a section called Collected Addresses for later reference. You can also lock out varying JavaScript elements from messages, but you need a third-party utility to correctly import an address book from your handheld.

Mozilla's other modules are fine, but little more. The News elements are sufficient for occasional browsing and posting but lack a dedicated ability to gracefully decode hundreds of attachments or even catch up elegantly. The ChatZilla IRC client does the job if you know your IRC command line options. The GUI doesn't already know them.

Composer, the HTML editor, is also fine, offering WYSIWYG and HTML source views, plus a semi-WYSIWYG view that any HoT-MetaL user will love. However, Composer doesn't color-code the HTML tags in code view, and it can't help you manage a site with multiple HTML and graphics files. It can upload and download your individual files to an FTP server.

Overall, Mozilla makes a compelling case for using two browsers. The app offers great compatibility with Web sites, a broad feature set, and a small resource footprint for Win9x/Me users. Mozilla 1.0 is certainly the best browser to come from Netscape code, and the fact that it's free is the deal maker. Give it a try, pronto. ▲

by Warren Ernst

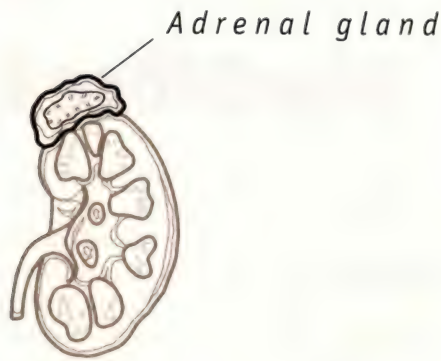


fig. 1



One essential piece of equipment for this game is in your body.

The other is in your computer.

A teeth-grinding adrenaline rush. A grenade-sized lump in your throat. The trigger-tingling sense that someone is watching you. It's all part of the over-the-top realism you'll experience in *Soldier of Fortune 2: Double Helix*. Why? Because this ultra-realistic game was designed for the optimum performance you can only get from a computer juiced with the high-speed performance of an NVIDIA® graphics processor. So plunge into the secret and deadly world of covert operations with the firepower of NVIDIA... and play the game the way it was meant to be played.



Visit your local CompUSA or log on to www.gamefixx.com/nvidia/

StarOffice 6.0

Sun giveth. Sun taketh away. Then Sun giveth some more.

First Sun Microsystems created StarOffice, a free office suite for Windows, Linux, and Solaris. And it was good. When Sun released StarOffice 6.0, devoted users were chagrined to discover it carried a \$75.95 price tag. But Sun also released much of the code as open source, leading to OpenOffice.org 1.0, a free version.

Both are powerful suites that rival Microsoft Office (which costs about seven times more than StarOffice), and each includes a word processor, spreadsheet, presentation software, and graphics program.

documents with complex formatting. A file in StarOffice can look very different than in its original Word version.

The Components

Writer and Calc are StarOffice's heart. Both offer most features an average user needs. Writer offers complex formatting tools, footnotes, spell checking, and columnar text. Calc includes auto-completion and a chart-generator wizard.

You can use the Impress presentation app to generate impressive PowerPoint-like presentations. Draw is a vector-based illustration tool for creating 2D and 3D objects that you can move and resize easily.

Adabas D, a relational database, isn't available as part of OpenOffice, and it feels like an afterthought in StarOffice. The personal edition is limited to 100MB of data, requires a separate installation process, and is scarcely mentioned in the print manual. In fact, you can download the app free at www.softwareag.com/adabasd.

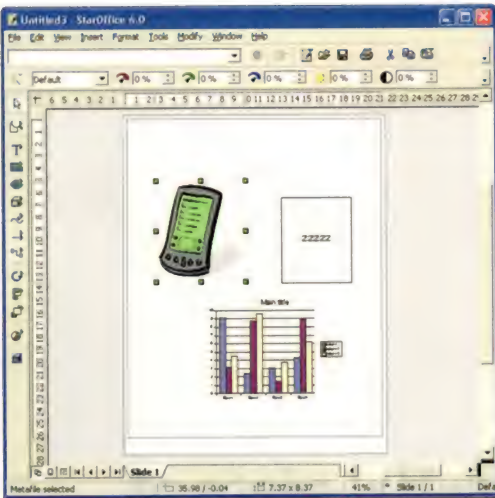
StarOffice's apps are nicely integrated, so sharing data is a breeze. For example, you can create a chart in Calc, drag it into Impress, and resize the chart to fit the presentation.

StarOffice doesn't attempt to be a work-alike. If you use another office suite, you'll have to adjust to finding certain StarOffice functions under different menus. The apps are generally intuitive, however, and a revamped help system is useful. The apps aren't particularly Internet-savvy, though. For example, you can't publish docs directly to the Web for online collaboration.

Swing On A Star?

StarOffice supports Linux, Solaris, and Windows (including Win95, which Office XP doesn't). The three installers are on one CD, and StarOffice is licensed on a per-user basis (install it on as many as five computers; you can install Office XP on only two). There isn't a Mac version, but an OpenOffice version is in the works.

Should you buy StarOffice or get the free OpenOffice? For a good print manual, easy CD installation, and access to technical support, go with StarOffice. ▲



StarOffice 6.0

\$79.95

Sun Microsystems

www.sun.com/staroffice



Similarities & Differences

Both suites share much of the same code, but StarOffice includes several features licensed from other companies, such as a database app, fonts, file format filters, templates, and a hefty clip-art library. StarOffice also includes two manuals and technical support that OpenOffice lacks.

New to StarOffice 6.0 are XML-based file formats that keep file sizes small and make data easily interoperable with Web services and multiple OSes. You can password-protect documents, and 6.0 adds support for Unicode, which lets the suite handle 10 languages.

6.0 omits several of 5.2's less-loved features, including the integrated desktop, Web browser, email, newsreader client, and the Scheduler, a tool for managing tasks and schedules. StarOffice does include an address book but lacks a PIM. Despite omitting some features, StarOffice 6.0 isn't exactly svelte. The standard installation takes up 250MB of drive space; the minimum installation uses 130MB.

The suite works with Microsoft Office's file formats, so you can share DOC, PPT, and XLS files with your Microsoft-using cronies. Although it can share files with Microsoft Word, StarOffice's Writer can have trouble interpreting

For a comparison chart of StarOffice and OpenOffice features, go to www.smartcomputing.com/cpumag/oct02/staroffice.

by Kevin Savetz

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Don't Kill The Shareware Industry

Yeah, I'm calling you from my private jet at 30,000 feet over Switzerland. Have you finished working on my red Trans Am? No, not the black one—the red one. Well, drop it off at my summer house when you're finished."

This is something you'll never ever hear the average shareware author say. Why? Because, contrary to popular belief, most of them aren't kazillionaires. They're not even millionaires. In the average year, they're lucky to earn as much as a fresh-from-college high school teacher. Those lucky enough to make that much face other obstacles along the way. These "basement developers" typically aren't marketing geniuses. They count on larger sites (like Tucows, WebAttack, or CNET's Download.com) for promotion. People seem to be dissuaded from downloading shareware with the "threat" of having to dish out a handful of hard-earned cash to register a program—especially if an alternative is free. That's economics. Still, skipping software based solely on its price tag (and not its feature set) is ill-advised. Looking for illegal workarounds is even worse.

When you run cracks or use serial numbers, you're breaking the chain. You may think software piracy doesn't hurt large companies because "they must be making it up in volume." Just remember that every company has employees, and every company has a bottom line. The more you take from them, the less they can give back to you. Now, imagine how those smaller publishers feel when someone cheats them out of a registration. In most cases, a registration costs nothing more than a single night out with your family. If you like the software, pay up.

Someone sent me a PDF via email the other day. It was a comprehensive guide to San Francisco's best stuff. I liked what I read, but I didn't think the document was free. My suspicion was confirmed; the ebook was ~\$10. Without thinking too hard, I clicked the PayPal link and sent the author the requested payment. After all, that's how I'd want to be treated. Wouldn't you? Don't lie to yourself.

And just because you see a banner or two on a Web site doesn't mean its owner is making money hand over fist with advertising. No. That market is completely dead for 99% of the

Internet. Some shareware developers share the profits by offering affiliate programs to publishers (often referred to as 'Cost Per Action' deals). Does it work? Sometimes, but not often enough. If everyone were honest, this column wouldn't have been written.

Am I saying you should run out and buy everything you ever use? No. Nobody needs to own four programs that do the same thing. But don't keep thinking that the other guy is going to register the program that you really, really like to use. Don't think that most of these shareware developers are living high on the hog. Don't think that they understand how the market works. Most of these folks aren't businesspeople—they're just trying to keep a business alive. Some developers code

out of passion, some out of necessity, but they all believe that people want and need to use their creations.

And what if a particular program is not perfect? Should you give up and move on? Not always. I frequently download shareware that has tremendous potential. Instead of instantly searching for another solution, I'll send a brief (bullet

pointed) note to the original author and suggest improvements. For the most part, I've never had my perspective challenged. You should already know that most programmers aren't artists, writers, or accountants. They're programmers, and they deserve our respect.

Your mission—and you **MUST** accept it if you've read this far—is to register one of your favorite pieces of shareware today. Right now. Why have you waited this long to do it? Why should I have to remind you that someone performed a service so that you could have a more complete computing experience? This general disdain for anything that's not free is sickening, and if the trend doesn't reverse soon, we're going to see a lot of good people burn out and a lot of great resources dry up—seemingly overnight. Tell them you appreciate their work. What's that going to hurt? ■

Don't think that most of these shareware developers are living high on the hog.

You can dialogue with Chris at chris@cpumag.com.



When he's not distributing technology tidbits through email (at Locker gnome.com), Chris is compiling new ebooks (for Gnometomes.com). Chris is also the host for "Call for Help" on TechTV (callforhelp.tv). Oh, and he thinks he wants to do a radio show again. Of course, Chris also wants to be a fire truck. He'll see which one happens first.



22 Short Reviews, Part 2



Pete Loshin, former technical editor of software reviews for BYTE Magazine (print version), writes about technology and runs the Internet-Standard.com Web site, which provides plain-language explanations about RFCs, Internet standards, and other IETF documents.

Here are the rest of the 22 reviews I started last month of free software I've used and have opinions about. Cross-platform programs are marked with an * and may be available for your OS of choice; apps marked with ## are included in the GNOME Office (www.gnome.org/gnome-office) meta-project and use the GNOME component architecture.

First, a quick recap of last month's reviews: Must haves include word processor AbiWord, Word file translator antiword, text editor emacs (or vi, if you prefer that), HTML editor Bluefish, publishing program LyX, spreadsheet Gnumeric, and browser Galeon; just OK browsers Mozilla and Netscape; StarOffice is the bloated office suite.

12. First this time around is Evolution## from Ximian (ximian.com). Billed as workgroup/PIM software, Evolution has been aimed right at Microsoft's soft underbelly: the virus-ridden Exchange client. Evolution rocks, which is actually a tribute to Exchange, except I don't worry about Nimda, et al. You can even buy Ximian Connector if you want Evolution to fully interoperate with Exchange. Evolution does mail, plus talks directly to my Palm. A great solution for Windows users on the edge.

13. For the full *nix mail experience, exmh (www.beedub.com/exmh/index.html) can't be beat. Combining a rich (if obscure) GUI with the classic *nix function of mh, this text-based mail handler is composed of simple commands. Each message is a separate file and mh commands provide various message sorting and shuffling functions. You string commands together, piping output from one as input to another or other *nix utilities. Awesome for searching your mailboxes for a particular keyword, fast.

14. With free software, you can always try different programs out with impunity because the only investment you usually have to make is the time to install and learn to use it. If it doesn't work right away, move on to another one. Programs like X-CD-Roast (www.xcdrast.org) for burning CDs are a drug on the market, but X-CD-Roast was the one I tried first, and it's worked well enough for my needs.

15, 16. Almost every Linux distro includes the GNU Image Manipulation Program## (the GIMP;

www.gimp.org) for graphics editing—kind of like Adobe's Photoshop, except more than \$600 cheaper. I don't do much with graphics, but when I do, the GIMP does everything I need. gPhoto (www.gphoto.org) is another one of those programs that works well enough, in this case reading digital photos off my digital camera and saving them to disk.

17. Everyone with a PC is a sysadmin, whether they like it or not, and free system utilities kick butt. Ethereal* (www.ethereal.com) sniffs packets on your network (802.x, PPP/SLIP, ATM, FDDI, and more) or imports captured traffic and analyzes the results. Most people don't need this, but if you do, Ethereal's an easy answer.

18. One thing you might not think you need is a system process browser, but

gtop (a GNU version of the "top" program that lists processes using the most system resources) is an invaluable applet bundled with GNOME. When a program freaks out or otherwise needs terminated with or without prejudice, you can do so with a single click and move on with your life. Gtop does nice charts and tables showing system resource usage, too.

19. Another handy applet, GNU's diskusage sits in a toolbar and gives a pie chart showing how much of your partitions are used (red) and free (green); click on the applet to see different partitions. Other cute little system monitor applets show network, memory, disk, CPU, and even swap activity.

20, 21. The find utility does just that, finding files based on regular expression searches; GNU locate is a turbo-charged version of find that uses an indexed file system database to track down files from the command line. Find them at www.gnu.org/directory/All_GNU_Packages/findutils.html.

22. That makes 10, more or less. Picking one more is tough: Should I mention Ximian's Red Carpet program/service for staying on top of software updates or GNU's (www.gnu.org) Ghostview postscript/PDF viewer program or one of the great desktop environments like GNOME or KDE? Stay tuned, and let me know about your favorite free software. ■

I don't do much with graphics, but when I do, the GIMP does everything I need.

Get saucy with Pete at opensauce@cpumag.com.



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and more convenient than ever. Visit us for details at www.nwa.com/checkin.



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Words From The Web

YEAH, THEY *ACTUALLY* SAID THIS . . .

Question posted in eBay Travel forum:

**CROSSING THE COUNTRY BY
GREYHOUND BUS BOTH WAYS.
CAN IT BE DONE?***Yes, but for the love
of God, don't do it!*From an AOL
chat room:**I HAVE
WEDDINGS ON
THE BRAIN . . .
I HAVE TWO
NEXT MONTH.***You're getting married
twice in one month?*

From a Lycos 30's chat room:

**I MUST GO TO MY
PILATES CLASS
OTHERWISE
MY TRAINER
WILL KILL ME***Forget the trainer.
The workout will kill you.*From a Yahoo!
Computing chat room:**DOES ANYONE
HERE HAVE A COPY OF WINDOWS 95?
I NEED SOME ASSISTANCE.***The assistance you need is that of a new OS.*

The Tao Of Web Sites

Here's proof that a company's Web site doesn't have to be a dull, boring collection of links and frames. Taobot's cool interactive flash site (www.taobot.com) has an animated top-down view of Taobot's headquarters that you can explore using an avatar. You'll walk the avatar through the building using arrow keys, encountering characters and objects as you move from room to room. The Web site reminds me of the old King's Quest games, in which you wander around somewhat aimlessly until you bump into an object or person that causes a reaction. Fun ensues.

When you walk by a character or object, a speech bubble will pop up. The characters usually have something funny to say, and your avatar will make comments about objects he encounters. Most of the speech bubbles include a button for more information, such as the company's email address and staff information. Watch your step when you visit one of the back rooms. You'll take a tumble to the basement, where a couple of dwarves (I assume they're interns) are slaving away at the business end of a whip wielded by Dennis the Gentle.

Infinite Loop Piracy Nation

A recent Ipsos survey of Internet users around the world found that 57% of folks who download software seldom or never pay for it. Here's a top 10 list of nations with the highest software piracy rates in 2001. Figures represent the percentage of downloaded software that went unpaid for.



Vietnam:	94%
China:	92%
Indonesia:	88%
Ukraine:	87%
Russia:	87%
Pakistan:	83%
Lebanon:	79%
Qatar:	78%
Nicaragua:	78%
Bolivia:	77%

“It seemed that the man in question was somehow defying logic, and carrying his entire hind-quarters above the rim of his pants.”

This quote was shamelessly lifted from a letter by Douglas Cooper to Levi Jeans. Douglas Cooper (who, as he likes to point out, is an electrical engineer) writes letters, lots of them, to various companies with suggestions for new products or improvements to existing products. Read his eyebrow-raising missives at www.theretort.com/theletters.html.



Stop by the Where's George Web site and enter your ZIP code and the serial number from a crisp dollar bill.



Write www.wheresgeorge.com on the bill and put it back into circulation.



Track the bill to see where it is and how long it took to get there.



Eventually, your bill will end up where all currency does, in Bill Gates' pocket.



SHOWN ACTUAL SIZE

THE GUIPM "ORIGINAL WORLD'S SMALLEST WEB SITE" IS IN FACT TINY, BUT IT'S PACKED WITH BIG SURPRISES. CHOOSE THE FLASH VERSION TO PLAY SEVERAL GAMES ONLINE, IN MINIATURE. THIS SITE'S A BIT HARD ON THE EYES, BUT IT'S EXCELLENT FUN FOR AT LEAST THREE MINUTES.



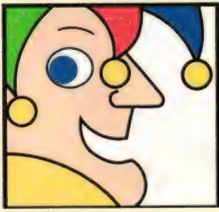
www.guimp.com/home.html



Can cats & dogs
be far behind?

WWW.FLINGTHECOW.COM/FLASH

If you find a strange, interesting, or funny Web site in the course of your Internet travels that you think is worthy of Fringe, send your suggestion to fringe@cpumag.com.



The Motley Fool

Forget What You Know About A Fool & His Money

The chocolate pudding story sounds almost too apocryphal to be true, like Newton and the feather or George Washington chopping his cherry tree. The story goes that when brothers David and Tom Gardner were kids, their father would stop them in the supermarket and tell them to eat more of this certain pudding. Why? Because the family owned stock in the company that made the pudding: Eating more of the pudding would help the company, increase the stock's value, and so, in a small way, enrich the family.

The Gardner patriarch, an economist and lawyer, continued to preach stock investment to the boys throughout their teens. When each boy turned 18, however, the tutorial was over. Their father said he'd been investing for them ever since they were born. He gave them each some cash to invest on their own and told them that was it. They were officially cut off. Whatever inheritance dear Dad would have at the end of his life would go to his grandchildren. The brothers did their research, bought into a company called Leaseway Transportation at \$26 a share, sold at \$42, and so started a lifetime career in investing.

The story picks up again a few years later. In 1993, David was writing for Louis Rukeyser's *Wall Street* newsletter, and Tom was teaching business at the University of Montana. The brothers decided to start printing a newsletter called *The Motley Fool*, named for the famous passage in Shakespeare's "As You Like It." David and Tom sent their unsolicited premiere issue out to a few thousand recipients and earned precisely 38 subscribers for their efforts. Convinced that this was not the easiest road to widespread recognition, they cast about for a better medium.

Enter the Internet. In 1993, America Online had no channels (at least not in the current sense), precious little organization or content, but two keen subscribers in the Gardner brothers. They realized that an online discussion board

philosophy is considered a Fool with a capital F) had attracted quite an online following and took the pair to lunch one day in the spring of 1994. AOL wanted more content and liked what it saw in the newsletter. The brothers turned *The Motley Fool* into a bona fide company, and, on Aug. 4, debuted as a full-blown destination within America Online. In 1996, the company's Web site followed at www.fool.com.

And so the Fool engine chugged along, riding the tech boom and dispensing financial wisdom to the savvy and inexperienced alike. The brothers' advice always centered on two themes: It is within practically everyone's power to save money and invest smartly, and the financial establishment is an incestuous, self-serving machine designed to milk the unwary. The Internet lets anyone gather the same information to which "full service" brokers have access. Why pay them a \$70 commission for a trade you can make through an online brokerage for \$7?

In the mid- to late-'90s, you almost had to try to lose money in the stock market. The brothers released four books, "You Have More Than You Think," "The Motley Fool Investment Guide," "The Motley Fool Investment Workbook," and "The Motley Fool's Rule Breakers, Rule Makers," which widened their reach further into the offline world. They started a syndicated newspaper column and radio show. Everything looked rosy, and so in 1999, tens of millions of dollars in venture capital money started arriving.

Fools Regroup

Those venture capitalists are still waiting to get their money back. As students of the stock market, the Gardners had witnessed countless examples of companies that went

*A fool, a fool!
I met a fool i' the forest,*

A motley fool; a miserable world!

As I do live by food, I met a fool

**Who laid him down and bask'd
him in the sun,**

**And rail'd on Lady Fortune
in good terms,**

**In good set terms and yet
a motley fool.**

**'Good morrow, fool,' quoth I.
'No, sir,' quoth he,**

**'Call me not fool till heaven
hath sent me fortune'**

— WILLIAM SHAKESPEARE,
"AS YOU LIKE IT," ACT II SCENE VII

could not only put them in touch with others interested in stocks and investing but also help find recipients for *Ye Old Printed Foole*, as the newsletter is now remembered. As the months progressed, the brothers found themselves pounding out the newsletter in the last two or three days of the month—imagine that, two English majors procrastinating until the last minute—and spending the rest of their available time fielding and asking questions with other discussion group members on AOL.

Meanwhile, America Online noticed that the two Fools (anyone who adheres to the brothers' unconventional investing

public prematurely and lived (briefly) to see the consequences. So they were cautious, which is why they're still here. In early 2000, the tech slide began, and the advertising market dried up. Because The Motley Fool derived most of its revenue from advertising, prospects looked grim.

The company quickly put its three-pointed thinking cap on and complemented its existing services with new premium ones, such as company research reports and Soapbox.com, a marketplace where individuals could buy and sell market-related reports. These services started recouping losses from the ad side but not quickly enough. In February 2001, The Motley Fool laid off 115 of its 355 employees in the United States and United Kingdom and killed its Soapbox.com product.

Despite the fact that many other online publishers and financial services were similarly trimming staff or outright disappearing, critics were keen to finally take a whack at the company that had devoted so much text to criticizing the Wall Street establishment and debunking the flocks of quack investment advisors.

"The Motley Foolers are cute marketers—of themselves," quips one writer at the TurtleTrader site. "They sell lots of books and they wear funny hats. But how can Motley Fool make a difference in your trading decisions? It can't. There is no substance to Motley Fool, no matter how the Fool packages its information."

Substance or not, even as it was slicing away one-third of its employees, the Fool still claimed a viewership of 30 million. The Gardners, now accompanied by CEO Patrick Garner, former regional president for Coca-Cola (a favorite Fool stock), continued to experiment with existing and new services. The Gardners have a new book out, as well. "The Motley Fool's What To Do With Your Money Now" takes a long look at today's recession economy, personal debt, and whether investors should be more conservative with their cash.

And unlike most of its critics, The Motley Fool is cash flow positive, so perhaps there's some substance there, after all.

Fool.com Now

Another third of the old Fool staff has been pared away, leaving a head count of roughly 100, yet the site remains strong and filled with information for new and experienced investors. Keep in mind, though, that The Motley Fool isn't just about stocks. It's about a way of life and thinking. We know many readers are just as guilty as we are of cultivating expensive hardware habits. If you get upside-down with your cash flow, the Fool has advice for how to save big bucks big time—everything from finding cheaper airfare to refinancing your home to coping with credit card debt. From the Fool.com home page, check out the links for Special Features and Personal Finance. It was here, for example, that we discovered the 529 Plan, a little-known, state-supervised education investment program that trounces the more conventional Education IRA. Got kids? Start reading.

If you're ready to start investing and aren't sure where or how to begin, start by clicking the Fool's School link. This is great 101-level material for any newbie, all written in typically plain, everyday Foolish English. As your proficiency in discussing price-to-earnings ratios and dividend reinvestment plans increases, switch over to the Investing Strategies section. Here you'll find articles on The Motley Fool's various portfolios, why they contain the stocks they do, and how they've stacked up against market averages over time. The Fool isn't above admitting its mistakes, either. The Lessons Learned area (www.fool.com/portfolios/discontinued/intro.htm) offers some valuable insights into how even experts can go wrong.

The Quotes & Data tab on The Motley Fool's home page offers access to 15-minute delayed stock quotes, as well as information about any traded company or fund. This is the same collection of charts, financial statements, news, and other material you'll find at Yahoo!, AOL, or any other finance portal.

Where the Fool shines above many competitors is its My Portfolio area. Services such as My Yahoo! and others let you track commissions, shares owned, and such, but the Fool's My Portfolio

gives you far more flexibility in viewing factors such as average cost per share, percentage of total portfolio, and volume.

After seven years of free access, however, The Motley Fool's foundation, its discussion boards, is now a premium service. For \$29.95, you can dig into the insights of thousands of other Fools and use this to make more profitable investment choices. Don't go looking for quick answers, though. The best fool discussions are moderated and well-balanced, meaning you get both sides of the argument. Today, AOL is a shadow of its former self. Does this mean it's a good time to buy or the last gasp before bankruptcy? Well-spoken Fools will present you with both sides.

Other services include the TMF Money Advisor, a \$149-per-year service that gives online and phone-based answers from professional financial advisors. (David Gardner describes it as AAA for your money, designed to help people construct solid financial plans.) Another is the Fool's return to its roots, the Motley Fool Stock Advisor newsletter (\$99 a year), filled with market outlooks and stock recommendations.

Log In, Fool On

If you're still reading, chances are that you're already familiar with The Motley Fool or at least interested in online investing. However, if the down market has you reeling and running scared for the comfort of savings accounts with interest rates that hover a smidge or two over the level of inflation, don't give up on stocks and funds.

The Gardners founded The Motley Fool for people just like you. They would tell you that since 1930, the stock market has averaged 10% to 11% annual gains, even counting the doldrums of the '30s and '70s. Now isn't the time to flee. Now is when you learn what you need to be ready when the economy starts climbing again. The Fool won't guarantee you higher returns on your investment, but it will guarantee that you'll be better educated about how the market works and how you can make more intelligent decisions when handling your hard-earned money. **CPU**

by William Van Winkle

Top Brass

We spoke with David Gardner, co-founder of The Motley Fool, about his thoughts on investing in technology stocks, the state of the market in general, and where Fools fit in.

CPU: Did either you or Tom foresee the tech slump we're in now?

Gardner: No, not really. I mean, I think that some people did, but few overall. A lot of people were saying the market was overvalued in '95 and '96. They were wrong for about four years—four of the best years in stock market history. Some of them then were right once it became 2000, 2001.

We're users of technology, fans of technology. We think America has the best technology, and we think that free market capitalism leads to technological innovation and technological adaptation in an unprecedented powerful way. So we are tech bulls basically right through a tech bear market because the advances being made in biotechnology, even during a down economic environment, are strong.

We're not really market timers, and we've held our investments like AOL Time Warner, which began as a tech stock, right through. We've only ever invested in top-drawer companies. And that's an emphasis of ours in all of our writings and thinking. I never invested in Dr. Koop.com, which is kind of our standard whipping-boy company for the crummy company nobody should have invested in. There were a bunch of companies that were crummy that had billion dollar valuations, and we consistently lampooned those.

CPU: Surely the market can't go any lower, right?

Gardner: The market can certainly go lower. Some

people call our radio show and say, "Hey, guys, Kmart's at \$1! This is Kmart—it can't go lower, can it?" And obviously, it can. It can go to zero. Our economy's not going to go to zero, but the stock market is very much tied up in short-term sentiment, and sentiment can be even more negative.

CPU: When do I want to start investing in tech stocks again, or should I just learn my lesson and start buying treasury bonds and mutual funds?

Gardner: I think you should decide how much time you have to invest. If that's money you won't be touching for at least five years, I think you should continue to put that money into a stock market index fund, if you're not an enthusiast for investing (which describes most people). You have to realize that one in three years is a down year for the stock market. Historically, those are the odds, and when those years happen to occur consecutively, it really dampens sentiment, so it seems like, gosh, why would I invest in the stock market? But you know what? History shows that it's the best time to buy.

CPU: Was it the luck of the draw that you landed on AOL and not Prodigy?

Gardner: Actually, it's not, because we were on Prodigy. We had begun kicking around the other services just to see what they were like, and Prodigy was just penny stock-ridden. The low-quality discussion about stock was just unbelievable. It was basically

people hyping penny stocks to each other. There were a few ringleaders, it seemed to us, and we went on and said, 'This is not investing. Actually, we're

able to put up an article and have thousands of people read it that night and send me additional ideas. Eventually, we realized it was actually a



David (left) and his brother Tom Gardner have been helping average people manage their money through The Motley Fool since 1993.

not even sure this is legal.' We were saying stuff like that, so of course we got flamed by the people on Prodigy. In effect, we were trying to do on Prodigy what we did on AOL, but the reception on AOL was so much more hospitable and legal. Actually, we ended up parodying what was happening at Prodigy.

CPU: Why did you feel compelled to educate the public about investing when you had no formal credentials in the space?

Gardner: It began as sort of "I'm a writer and, gosh, I wish people would read my stuff!" That's the way it really started. Then the addition of the online medium was, hey, not only do they read it, but they respond. As a writer, what a very fulfilling life this is to be

business, and then we incorporated almost a year after we had launched on AOL.

In time, it wasn't so much that we were compelled to educate others; it was that it was and should be a profitable opportunity for us as a business. Because the fact is that people haven't gotten this education. We can bemoan that, but we can also figure out how to give it to them, make a buck at the same time, and build a company that we can be proud of. That's a motley answer, but that's basically the way that I think about it. ▲

For our full interview with David Gardner, see www.smartcomputing.com/cpumag/oct02/fool.

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PROVEN SOLUTIONS FOR STORAGE MANAGEMENT

Coder's Corner: XML

Device-Independent Forms With XForms

In Coder's Corner: XML, Ian Graham shows you how to program with XML. Ian is the author of numerous books pertaining to Web development, including "The HTML Sourcebook" and "The XML Specification Guide."

Last month, we discussed XUL (XML User Interface Language), the Mozilla Project's platform-independent language for defining a user interface's component parts and layout. Mozilla's browser uses XUL to define the user interface, including the nature, position, and functional connections of the various user-interface controls.

XUL is flexible but has some design limitations, including device-dependency. XUL assumes a user-interface model based on a standard desktop computer GUI. XUL elements essentially correspond to real widgets being displayed or rules defining how these widgets are positioned. A XUL document defines the relative positions and layouts of these elements (with help from CSS), thereby defining the overall user interface.

This limitation isn't a problem for Mozilla, where XUL's role is to define traditional interfaces. In other cases, this limitation can be a big problem. Suppose you need a single Web app for a standard computer interface and a PDA. The interface needs to be very different. XUL simply doesn't fill the bill.

XUL still has an important role because regardless of how an app's user interface looks, the interface's *purpose* is unchanged: gather and display the same information. The ideal is an XML language that can express the interface's purpose in a device-independent way and that can be easily mapped onto an appropriate presentation.

Device Independence

This is the goal of the XForms language, an XML standard being developed by the W3C. Work

on XForms started as an offshoot of XHTML work, as XHTML forms were weakly designed and needed changes to make them as flexible and functional as desired. A separate forms working group was created in 2000, with a goal of a device-independent language for describing form-style input that:

- Is device independent but works well on standard desktop Web browsers
- Supports universal accessibility (for alternate user-interface modes)
- Strongly separates presentation from purpose (such as model from view)

Doing this meant many substantial changes with respect to HTML forms, which partly explains why more than two years later, the XForms spec still isn't finished. However, the draft standard is stable, and XForms-based products are being released.

In short, XForms has three main parts, including:

- **XForms user interface.** This set of elements defines standard interface-independent controls, such as selectable lists, buttons, and text input mechanisms. These will eventually replace the current XHTML form controls. XForms also has an <output> element to reference live data in a form. A user interface can use this to include live data in the displayed content.
- **Instance data.** This is an internal XML representation of the data associated with a set of form controls. Having a separate instance data component cleanly separates the data from the controls. XForms user-interface controls are bound to instance data content using explicit XPath expressions (XML's mechanism for referencing locations in an XML document).
- **The XForms model.** This is the overall XForms processing model. For example, when a user submits a form, the XForms model defines how data



This illustration shows how the X-Smiles browser renders an XForms example document in different devices, including the cell phone, desktop, and PDA interfaces shown here.

is bundled for delivery (it's typically turned into a stream of XML data corresponding to the data content of the instance data). The XForms model also defines ways of setting—using XML markup—constraints on form data. For example, a constraint might be text entered into a box that must be a number greater than five or that a string must match the pattern for an email address.

All this may seem confusing, but consider this XHTML + XForms example:

```
<html xmlns="http://www.w3.org/1999/xhtml"
  xmlns:xf="http://www.w3.org/2002/01/xforms" >
<head>
<title>Example of XForms in XHTML</title>
<xf:model>
  <xf:instance />
  <xf:submitInfo method="post"
    action="http://www.example.com/submit.pl"
    id="myForm" />
</xf:model>
</head>
```

```
<body>
<h1> Example of the Form</h1>
<p>Here is a simple example XForm
form, intermingled with XHTML.
</p>
<group xmlns="http://www.w3.org/2002/01/xforms" ref="purchaseInfo">
  <selectOne ref="@ptype">
    <caption>Pet Type you Want to
Buy</caption>
    <choices>
      <item>
        <caption>Dogs</caption>
        <value>lupus</value>
      </item>
      <item>
        <caption>Cats</caption>
        <value>feline</value>
      </item>
    </choices>
  </selectOne>
  <input ref="CardNo">
    <caption>Credit Card</caption>
  </input>
  <input ref="Exp">
    <caption>Expiry Date</caption>
  </input>
  <submit submitInfo="myForm">
    <caption>Buy that Pet!</caption>
  </submit>
</group>
</body>
</html>
```

Here the HTML element declares that the prefix `xf` corresponds to the XForms namespace. Inside the HTML head element there is XForms markup declaring the model (`xf:model`) for the form. The `xf:instance` element creates an instance data element (in this case, there is no data, as the `xf:instance` element is empty), while the `xf:submitInfo` element labels this form submission mechanism (`id="myForm"`) for reference by specific form UI components. It also defines what to do when the form is submitted (post it to the indicated URL).

The XForms user interface markup is inside a group element inside the body of the HTML document. On group the `xmlns` attribute is used to reset the default namespace to that of the XForms language. Thus, you don't need a prefix for XForms

elements inside group. Group also has a `ref="purchaseInfo"`. This attribute defines where in the instance data tree the data from this form UI element should go. Values of `ref` attributes are actually XPath expression defining locations within the instance data tree. `ref="purchaseInfo"` means the data should go inside a `purchaseInfo` element at the root of the instance data tree.

First inside the group element is a `selectOne` element containing a caption and set of choices (each choice in an item element). The `ref="@ptype"` means that in the instance data tree, the data from the `selectOne` will be stored as the value of an attribute named `ptype` on the `purchaseInfo` node. These XPath expressions can seem complicated, but the idea is pretty simple. The `ref` expressions define where in the output data structure the form data should go.

Last, two input elements define captioned text input components, while the submit element (also with a caption) defines the button that will submit the form. The `submitInfo="myForm"` attribute attaches this submit function to the `submitInfo` element with this same label.

How this document displays depends on the device and how the device's UI system best maps the UI components onto the display. This can vary greatly, but note how the XForms markup uses concepts that are independent of specific presentation details. Of course, CSS and other mechanisms can help customize and/or refine the styling, and CSS supports a media types option so different CSS style sheets can be applied to most types of devices.

So, Where's The Beef?

This sounds neat, but where are the real-world XForms apps? There aren't many. XForms is pretty new. However, XForms will be a core component of XHTML 2.0, so you can imagine there will be plenty of XForms somewhere in your future. **cpu**

by Ian Graham

(NOTE: Full examples of the documents in this article are available at www.smartcomputing.com/cpumag/oct02/xml and www.utoronto.ca/ian/articles/oct02/)

Web User Testing: Part I

One of the most overlooked and ignored aspects of the Web development cycle is user testing. I believe the reason for this oversight is twofold. Clients and designers are always eager to jump in and start building a gorgeous Web site. The misconceived logic is that if the site makes sense to the internal staff and the designers, it'll make perfect sense to the end user. The second reason for the oversight is that clients and designers simply don't know where to begin, when to begin, or how to conduct a user test. Therefore, the idea of a user test is "swept under the rug" and forgotten. In this three-part series, I'll shed some light on quick, inexpensive techniques for conducting a user test and evaluating its results.

When To Begin?

User testing should begin before production. This may sound like a no-brainer, but often clients want to start producing a site and then test it with users. The idea is that users will be working with a real site and will provide better feedback. The problem with this approach, however, is that once you get into production, the design team has already decided on the information architecture and a visual design, and the production folks have already started chopping up graphics and hacking away at the HTML. Think about how much time, money, and emotion has been invested at this point. I've found that clients and designers are more apt to ignore user feedback from late tests because it often means redoing a lot of work that they are already attached to.

How To Get Started

As soon as you have finished the information architecture and decided on a visual design direction (see my column in the April, May, and June CPU issues on the Web Design Workflow), you are ready to begin testing. You start by developing a list of testing scenarios. These should be typical or important tasks that users will perform while visiting your Web site. For example, if your site sells

candles, your list of tasks will include finding or searching for a particular candle, purchasing a candle, and purchasing multiple candles. Come up with a list of five or so tasks to test.

Create A Testing Prototype

Each task on your list has a natural order of screens that the user will progress through. For instance, users will start on the home page, use the search box to find a candle, and click Go to get a page with results. Then they'll click on a result and end up at a detail screen, etc. You can create a testable prototype by designing a series of screens (which I call a "click-through") that illustrate a user's path through a particular task. These screens can be completely graphical—made in Photoshop or Fireworks to look like the completed Web page, text and all. These screens should be made to look totally real using the visual design and navigation structure you plan on using for the site. Even the text on the screen should be real and not "greeked-in" as placeholder text.

You can then use Photoshop or Fireworks' features to add slices, hot spots, pull-down menus, and rollovers to each page for added realism and to link the pages together. (Both of these programs will export an HTML page.) For example, the home page nav bar should have dead links `<a href="#">` on all buttons and links so that the user sees the pointing hand when she rolls over them. Make one of the buttons link to the next page of your click-through. In total, a click-through could have anywhere from three to seven pages, depending on the nature of the task.

You should develop one click-through set for each task you want to test. In the next article, I'll discuss techniques for conducting a user test with your click-through, including finding people, how long each test should last, and what questions to ask. ■

You can contact Lisa at lopuck@cpumag.com and see her work at www.lopuck.com.

You can create a testable prototype by designing a series of screens (which I call a "click-through") that illustrate a user's path through a particular task.

Lisa Lopuck, www.lopuck.com, is a Web creative consultant helping companies define and plan their Web creative strategy, information flow, and visual look and feel. She is also the author of numerous best-selling books on Web design, including "Web Design for Dummies," and is a sought-after speaker at Web conferences and universities around the world.

bandwidth.txt

Bandwidth is a drug. At first you don't really know what it is, and you think you're fine without it. Then you get your first taste . . . maybe at school or at a part-time job. Suddenly you're flying—downloading Web pages in seconds, streaming video, and peer-to-peer prerelease movies camcordered by a dude who has a cough and epilepsy.

From those early days as a casual user, it's a slippery slope until you become a regular user: a T1 at the office, cable or DSL at home. Regardless, you find yourself storing CD images backing up your stuff on other machines on the other side of the planet. You download them and burn a fresh disc rather than leaving your chair because it's just easier that way.

But then you're hooked. And as tends to happen to addicts, something goes wrong. Maybe your supplier's source dries up, and you get days on end of down time. You curse the corporation that is preventing you from getting your fix, ignoring your tech support calls, and usually still billing you for your suffering. Or worse, you move.

And there's where I am. I moved across the state. And in the process, I swapped out my shiny, 1.5Mbps cable modem for a tattered and torn 56K modem. It's the slowest connection I have had since my sophomore year of college when my 28.8K modem was my lifeline.

That was three months ago. Since then my connection has not been "Always On." And when it is on, at best I get 5K a second, but usually it's more like 3.

Now I've tried to find a new dealer, and one claims that he can hook me up at my home. But he continues to delay his installation every few weeks. And in the meantime, I've been getting used to no longer flying along at impossible speeds and instead crawling along at a snail's pace: a frozen snail in a coma.

What does this mean? It means that downloading my email each morning takes a half hour or more. The hundred spam a day represent 20 minutes or more of download time. The Outlook viruses consume even more of my download time. Web pages with Flash and Java look pretty much the same because I just leave that crap off. But those pages with thousands of mouseover Java script pictures take minutes to download.

So why am I telling you all this? I've been designing Web pages for a while now. I remember when the CENTER tag first started appearing. And background pictures for Web pages? The possibilities were so exciting back then. But we had to learn to be careful with our byte. Each bit is precious if you want users of your page to have a strong low-bandwidth experience. Carefully trim the palette of Web pages. Shun fancier bloated graphical menus for text. And all to make the user's experience of your Web site as quick as possible.

We need not throw design out of the window. It takes a little more effort to design a low-bandwidth Web page, but with a little practice, your page can still be visually attractive but many K less. Avoid things like Flash and Java. Use Java script sparingly. If you're using JPEGs, drop the quality setting a bit. If you're using GIFs, try reducing the palette a bit. And regardless of image format, make images a little smaller.

Often designers make the mistake of using a large image containing text and a texture. Try using a table, with a smaller tileable background image and putting your text in that.

Not only does this make your text indexable by search engines, but also it lets users cut and paste important information out of it.

Low bandwidth users will be less likely to flee your site if you make good use of your kilobytes. And higher bandwidth users won't notice the difference if you're just intelligent about your design.

As for peer-to-peer applications, there's nothing anyone can do about that. But you're less likely to be sued by corporate monoliths if you buy your CDs and rip them yourself anyway! And you're going to want a gigantic cache in your Web browser and an even larger storage drive to keep anything you might want again. Thank god hard drives are cheap these days.

So you can do your 12-step anonymous support group for bandwidth, but in all fairness, this is one monkey I think we would prefer on our backs. ■

You can contact Rob at malda@cpumag.com, but no attachments please!



Rob "CmdrTaco" Malda is the creator and director of the popular News for Nerds Web site Slashdot.org. He spends his time fiddling with electronic gizmos, wandering the 'Net, watching anime, and trying to think of clever lies to put in his bio so that he seems cooler than he actually is.

Each bit is precious if you want users of your page to have a strong low-bandwidth experience.

by Joan Wood

Drive-by Prototyping



Starting as gopher for the Emmy-winning team that pioneered live in-car TV cameras for the Indy 500, Joan became an independent video/sound engineer, technical director, and producer. Playing with Reality Engines and motion platforms led to co-founding Xatrix Entertainment, where she produced the two Cyberia games. Before 3D acceleration was trendy, she formed Mango Grits to develop hardware-only game Barrage for Activision. Since cashing out from SharkyExtreme.com, where she was co-founder and managing editor, Joan has retired.

There is a guy eating Pringles outside your house. He is thinking: (A.) It is your bandwidth. You pay for it and you should be able to share it. If you choose to leave your wireless LAN open, anyone should feel free to access at will. (B.) It is your bandwidth. You pay for it and no one should be using it without your express permission. (C.) It is not your bandwidth. You pay for it but only for your own use. Whatever you (or your household) do not use personally is owned by the service provider.

The legal and ethical issues of community wireless networks and war chalking private access nodes on sidewalks are currently overshadowing technical concerns. Besides the potential legal ramifications of having unknown persons use your connection for criminal purposes and the authorities tracing the activity back to you, there is the possibility of lawsuits stemming from damage caused to third parties with your implied assistance. (You didn't stop them from using your access, did you?)

Broadband providers are faced with taking a stand on access sharing via wireless LAN and some are deciding to issue "cease and desist" ultimatums to customers who allow non-subscribers to tap into their access. Think of it as the "all you can eat" salad bar model. You may pay a flat fee for unmeasured broadband access, but that doesn't mean you can pass out garbanzo beans to the guys parked out front who haven't subscribed. But other providers are actively supporting the implementation of public wireless access nodes. Electronic Frontier Foundation (www.eff.org) maintains a list of wireless-friendly service providers. For those wishing to participate in public networks, EFF advocates voting with your feet and dropping service with restrictive companies in favor of those that support community wireless efforts. Boingo Wireless Internet Service (boingo.com), from the guys who brought you Earthlink, offers support for "Free Communities" and will promote your access point on their network without charging users to access it.

You can also deploy a commercial node on Boingo's network to generate revenue, so there

may be changes ahead when folks see dollar signs instead of civic duty. Others may just want to avoid the hassle and purchase a subscription to wireless service. Boingo Pro is \$24.95 for 10 connect days (single access location/day) per month, Boingo Unlimited goes for \$74.95/month, and Boingo As-You-Go is \$7.95 per connection day (single location/day) with no monthly fee. Competitors Joltage (joltage.com) offer monthly access up to 3,600 minutes and 500MB download for \$24.95, and Pay As You Go for \$1.99/hour, one hour minimum. And Ricochet is back. Only in Denver so far, but spreading to San Diego next and then . . . as far as the new business model and lightened debt load will take it.

But it is only a matter of time before big business reshapes the wireless landscape to suit. Intel has a plan. Service providers need simplified billing across multiple networks. Hardware manufacturers require decreases in size, cost, and power consumption. Software application developers need new standards on which to build. And every device will need an IP address. The company has thought it all

through and is offering the industry comprehensive solutions. (www.intel.com/labs/wireless)

So when an Intel R&D Lab spokesman talks about "intelligent roaming" for your mobile computing needs, he means "seamless, continuous, authenticated, secure, and easy-to-use" connectivity. It doesn't have quite the same meaning as when a cruising hacker with GPS receiver, roof-mounted antenna, and mobile laptop uses the term. But then, the Intel guy is talking about "Building the Wireless Tomorrow," and the hacker dude is surfing through your network right now.

Which is why I am actually pleased to hear that at least a few of those Pringles-can-wielding gentlemen actually work at Intel labs. Who better than an experienced war driver to help design the next phase of mobile computing? ■

Who better than an experienced war driver to help design the next phase of mobile computing?

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Road Warrior

Step Up To 3G, Buying At The Mall, Pocket PC Phones Arrive, Dangerous News & More From The Mobile Front

Buy PDA Software At The Mall

Despite the vast amount of PDA software that exists, you rarely see even the most popular applications available at retail outlets such as Best Buy or CompUSA. EZ ZAP (www.ezzap.com) software is hoping to change that. In July, the company tested its first public kiosk for purchasing and installing applications on Palm OS devices.

The kiosk, placed near the company headquarters in Des Moines, Iowa, houses a variety of free software in addition to moderately priced titles ranging from \$5 to \$29.99.

Users can search for specific titles and select an application using a touchscreen display. Once selected, the kiosk can collect billing information and install the application via infrared.

In addition to Principle Bank, EZ ZAP is partnering with the well-known Palm software site PalmGear (www.palmgear.com), which is providing the applications for the kiosk from its database.

Although most of us are comfortable enough with the current Web-centric distribution model, having similar kiosks in airports would be, well, neat. Placing kiosks at retail outlets will also help make the general public and PDA newbies more aware of the fact that their \$400 hardware can do more than just store phone numbers and appointments. ▲

Everyone Loves A Lawyer

Are there no two words in the English language more beautiful than "patent infringement?" RIM (www.rim.com) and upstart Good Technology (www.good.com) may not think so. The companies are trading legal blows over Good's new unified wireless messaging software that runs on RIM handhelds. Good released its software earlier this year, but RIM has been in the wireless email game since it announced its BlackBerry device back in January 1999. Good actually struck first, filing a lawsuit seeking to invalidate RIM's patent on unified email. RIM, as you might expect, filed suit on grounds that Good's technology infringed on its unified email patent. In August, RIM filed an additional suit claiming Good has engaged in unfair competition, false advertising, trademark infringement, and trademark dilution. Too bad RIM doesn't have a better lobbyist in Washington; maybe it could try to make it legal to hack Good's software. ▲

3G Is Finally Here

Many of us have been content to play with 2.5G networks, such as GPRS, while patiently waiting for 3G networks to finally arrive. We got our first look at 3G wireless in August when Sprint finally flipped the switch on its CDMA 1xRTT (single carrier radio transmission technology) network.

The new network covers every U.S. city with a population of more than 100,000. In addition to handling more voice calls (meaning fewer dropped calls for all), the network lets users download data at speeds as fast as 144Kbps (although 60Kbps is probably a better estimate of actual download speeds).

If 3G doesn't sound a whole lot faster than GPRS, keep in mind that 1xRTT is just a gateway drug for us wireless addicts. Once 1xRTT is going strong, companies can begin pushing the harder stuff, such as 3xRTT, which will offer download speeds approaching 2Mbps.

Of course, what good is a new network without a new toy? Handspring (www.handspring.com) announced its Treo 300 in August. Like the Treo 270, the new model includes a keyboard and a 12-bit color display. In July, Handspring acknowledged that the backlight on some Treo 90 and Treo 270 models was failing due to a defective component. According to information posted in the support section on Handspring's Web site, the company is using a new component, so the Treo 300 isn't expected to exhibit similar problems.

The Treo 300, of course, will support 1xRTT rather than GSM. The model will be available for \$499 directly from Sprint (www.sprintpcs.com). ▲

Handspring's new Treo 300 will support Sprint's new CDMA 1xRTT network, providing users with speed in the neighborhood of 60Kbps. Network download speeds are expected to increase over the next year.



Calling Pocket PC Lovers

We've mentioned Pocket PC phones before, but this time we won't tease you with word about some prototype or device available overseas. On Aug. 1, T-Mobile (www.t-mobile.com) introduced its Pocket PC Phone Edition.

If you don't recognize the T-Mobile name, you might want to get used to it. T-Mobile, a Deutsche Telekom subsidiary, acquired VoiceStream in June 2001. T-Mobile will slowly transition VoiceStream to the T-Mobile brand over the next several months. The Pocket PC Phone Edition is currently available to VoiceStream and T-Mobile customers.

The new phone includes 32MB of flash memory and a 206MHz StrongARM processor, not a new XScale processor, but considering Pocket PC doesn't appear optimized for XScale, you're not missing much. The device has all the software you would expect from a Pocket PC, including Pocket versions of Word, Excel, and Internet Explorer. Windows Media Player lets you listen to MP3 files, but you'll probably want to invest in an SD card to store your music on considering the Pocket PC Phone Edition's 32MB of RAM. The device measures 5 inches long x 2.8 inches wide x 0.7 inches thick and weighs 6.8 ounces.

A speakerphone or included hands-free kit lets you use the PDA while talking on the phone. Unfortunately, you can't IM a buddy while talking to your boss because the Pocket PC Phone Edition is a Class B GPRS device. This means the phone can connect to a GSM and GPRS network simultaneously but can only use one network at a time. Calls will interrupt a GPRS session until you hang up.

The phone supports GSM 900MHz and 1,900MHz networks, as well as GPRS networks for data. According to T-Mobile, the dual-band GSM support means the Pocket PC Phone Edition should work in more than 90 countries.



T-Mobile's Pocket PC Phone Edition provides users with wireless voice and data on a Pocket PC device.

Palm Still Rulez

In case you're scoring at home, Palm is still on top of the PDA market. According to IDC (www.idcresearch.com), Palm had a worldwide market share of 32.4% during Q2 2002. Approximately 846,000 Palm-branded devices shipped to consumers and retailers during that quarter. HP was a distant second with 18.6%. However, HP's numbers reflect shipments of Compaq's popular iPAQ Pocket PC, in addition to HP's own Jornada.

Sony was third with a 10% market share, and Handspring fourth at 6.5%. Handspring's numbers are a bit surprising at first glance, but IDC doesn't count Treo shipments because it considers the Treo a smartphone rather than a PDA. Handspring hasn't released a straight PDA since its Visor Neo and Pro models in September 2001.

Sharp's Linux-based Zaurus PDA put that company in sixth place with a 4.3% share. Newcomer Toshiba's Pocket PC devices landed that company in seventh. RIM finished next with a 3.4% share.

Despite Palm's dominance, the number of units it has shipped decreased compared to Q2 2001 when it shipped 1.27 million PDAs. Considering worldwide shipments were down by 16%, some drop off is expected. The looming release of Palm OS 5 devices does nothing to help increase demand for the current generation of Palm hardware, however.

Although IDC's report focused on units shipped, Gartner (www.gartner.com) released a similar report showing HP was actually first in total revenue. Gartner's total units shipped numbers did track closely with IDC's results.

Update your scorecards.

Dangerous News

Danger (www.danger.com) sounds like it might be the legitimate face of Dr. Evil's Evil Empire, but as you probably already know, Danger is actually working on a wireless data device dubbed as the Hiptop. In August, Danger announced T-Mobile (see "Calling Pocket PC Lovers" for more on T-Mobile) will manufacture the first Hiptop device, the T-Mobile Sidekick. The Sidekick is expected to be available from T-Mobile sometime in the fall. Sidekick features include the typical PIM features (email, personal info, etc.) in addition to IM and Web browsing. A camera attachment will let users take snapshots.

Danger also announced partnerships with developers UIEvolution and nGame. Both companies will be working on Hiptop games while ActiveBuddy will provide an IM bot that will search for and deliver personal content via IM. Pumatech will provide the synchronization software.

Danger announced in August that T-Mobile will manufacture the first Hiptop device. The T-Mobile Sidekick should be available sometime this fall.



At Your Leisure



Plug In, Sit Back & Fire Away

The entertainment world, at least where it pertains to technology, morphs, twists, turns, and fires so fast it's hard to keep up. But that's exactly why we love it. For the lowdown on the latest in PC entertainment, DVDs, consoles, and just stuff we love, read on.

Warcraft III: Reign Of Chaos It's A Time For Heroes

Blizzard brings forth the third RTS in its masterful Warcraft series, and it has been well worth the wait. If you think W3 is just Warcraft II with a gorgeously detailed 3D engine, you'll quickly learn otherwise as the plot is revealed and the storyline sucks you in. The new 3D engine is vibrant and detailed, the cutscenes are probably some of the best you've ever seen, and the music and voice-overs suit the game perfectly.

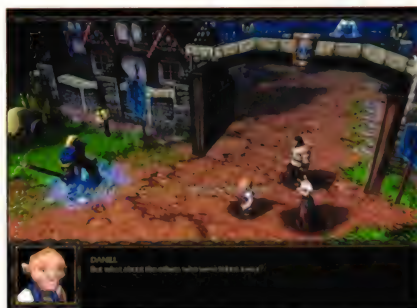


Warcraft III: Reign Of Chaos comes to life with the all-new 3D graphics engine.

In addition to the previously available Orcs and Humans, we get two distinct new races: the Undead and Night Elves. The addition of these races throws an interesting twist on the game. Blizzard has also added an RPG element to the game with the inclusion of the Hero unit. A hero can have a small inventory, level up, learn new spells, and pick up special items strewn through

the game. Beyond their gameplay value, heroes often serve as focal points for the story, ensuring your in-game character means something to you during battles. A new feature to the world of RTS gaming is the Upkeep feature; the game now penalizes you in gold for huge armies, forcing you to consider amassing a large body of units against maintenance and income.

There are a few blemishes: At times we felt that W3 was more action-oriented



The game's involving storyline comes to a head as you play through its four races.

and less focused on the strategic aspect. For example, we were surprised to find that there aren't as many structure-building options as Warcraft II. Also, unit AI seemed a bit faulty at times, but overall none of this was enough to detract

from what we thought was a very enjoyable RTS.

Warcraft III: Reign Of Chaos (PC, Mac)

\$59.95 & \$79.95 (Collector's Edition)

Blizzard Entertainment

www.blizzard.com

Check These Out On The Web

See our reviews of **NCAA Football 2003** (PS2, Xbox, NGC), **Enclave** (Xbox), **Syberia** (PC) and **The Mark Of Kri** (PS2) at www.smartcomputing.com/cpumag/oct02/gamereviews.



Play classic rivalries such as Auburn vs. Alabama in EA Sports' NCAA Football 2003.



Rau, the hero of Sony's The Mark Of Kri, is shown here with his spirit guide Kuzo.



Fight off the dark hordes of the outlands in Conspiracy Entertainment's Enclave.



Adventure fans take on the role of Kate Walker in Microid's surreal Syberia.

Eternal Darkness: Sanity's Requiem

Watch Your Sanity Meter

As *Eternal Darkness* begins, Alexandra Roivas gets a call from the Rhode Island police informing her that her grandfather is dead. She hops the next flight out and arrives at her



Eternal Darkness is chock-full of cool, picturesque temples and tombs.



In one of *Eternal Darkness*' opening sequences, you'll play as Pious Augustus, a Roman centurion who stumbles across a very dark secret.

family's ancestral estate to find that not only is he dead, but his head is missing. That's right; it's not just off, it's missing.

As she makes her way through the mansion looking for clues, Alexandra finds all sorts of interesting objects,

including a book made of human flesh and bone called the Tome of *Eternal Darkness*. As she reads the book's gruesome tales of mystical forces warring against a powerful, ancient evil,

you get to play as the characters portrayed in the book's pages. This is cool because the book chronicles the fight against this evil over vast centuries, which means you get to play all kinds of characters from several historical periods. You'll also use weapons appropriate to each era, so *ED*'s gameplay is always fresh.

ED is a solid third-person adventure game that offers some puzzle solving, some combat, and a healthy dose of atmosphere to go along with them. The game looks and sounds gorgeous, and thanks to the sanity meter feature, we think it's the most original survival horror game since the first *Resident Evil*.

The sanity meter is a green bar that appears each time your characters meet



Alexandra Roivas, heroine of *Eternal Darkness*, strikes a pose in her late grandfather's library.



Forget diamonds. Alexandra soon learns that a .38 is really a girl's best friend.

up with members of the game's menagerie of undead monsters. Your sanity drops each time you see a monster, and the only way to get sanity back is to finish the offending brutes off once you've beaten them down. The really cool part is that if you don't recharge your sanity meter, the game's Insanity Effects start messing with your head and with your ability to play the game. For example, the camera angle will tilt a bit more each time your meter drops, and you'll start to hear mad gibbering and moans and walls will appear to bleed. There are scads of other, even cooler effects, but we don't want to spoil them for you.

However, we can tell you that you probably won't expect some of them and all of them help make the M-rated *Eternal Darkness* a heaping helping of macabre fun.

DVD Byte by Todd Doogan

Fifteen years ago, Kirk and the crew of the *Enterprise* left super soldier Khan Noonien Singh on an isolated planet. Little did they know that Ceti Alpha V was destined to die. Now all Khan can do is think about getting his revenge, and when he gets the opportunity, he seizes it with both hands, proving revenge is a dish best served cold. "Wrath of Khan" is the best of the *Star Trek* films. It's completely accessible by film

fans: Trekkie or not. Splicing together the theatrical cut and the expanded TV edition, this new two-disc DVD rounds out the film a little more;



and the film looks and sounds great. On the extras side we get two commentary tracks, one with the director and another text-based track from a *Star Trek* expert. The second DVD is loaded with featurettes on the production and it's art design, as well as archived interviews with all the major cast members. This is a DVD all fans can appreciate. ▲

Eternal Darkness: Sanity's Requiem (NGC)

\$49.99

Nintendo

www.nintendo.com

Madden NFL 2003

It's Good To Be King

We might as well get to the point: Madden NFL 2003 is the best football game we've ever played, bar none.

Longtime football video game fans won't be too surprised to see such a glowing assessment of what is the benchmark for football video games, but it's easy sometimes to forget how significant Madden's dominance is.

There were times in the franchise's history when there wasn't much competition, but in the end, every football game released in the past dozen years or so has been measured by how it stood up to that year's installment of Madden. We're happy to report that there's plenty of competition this year, but the result is the same. We've played lots of football video games in the past couple of months: Nothing on the market today is as complete, as gorgeous, or as fun.



49ers running back Garrison Hearst leaves a Rams linebacker grasping at thin air.

Madden 2003 is by far the easiest game to mistake for an actual football broadcast by casual observers. The player models look even better than last year's (which were better than most of what you see in the other guys' 2003 games), including better proportions and ultra-realistic movements.

The sound is just as good, and although we miss Pat Summerall's voice-overs, Madden is... well, he's John Madden, and Al Michaels does a great job in his first outing.

We like Melissa Stark's contribution, and EA added new songs from Top 40 artists.

Where Madden 2003 really shines is gameplay. The improved minicamp and franchise features are a blast, but none of that really matters if a game isn't fun to play, and Madden delivers fun by the boatload. The most significant improvement over last year's version is a slightly tweaked control/physics model that makes cutting a little easier. EA didn't tweak control to the point where you can get away with cartoonish, instantaneous 180-degree cuts, but juking and cutting back are much smoother than in last year's offering, and the result is stellar.

The PS2 and PC versions also feature online play, although PS2 owners will need to purchase Sony's \$39.99 Network Adaptor kit to play online.

Madden NFL 2003 (PS2, Xbox, NGC, PC)

\$49.99 (\$39.99 on PC CD-ROM)

EA Sports

www.easports.com

NFL Fever 2003

Sophomore Effort Has Ups & Downs

When Microsoft threw its hat into the football video game ring last year, its NFL Fever 2002 got the franchise off to a strong start. There's a lot to like about these games, and this year's installment holds onto the majority of that good stuff while adding some new twists and turns.

Like other leading titles, Fever offers both simple sit-down-and-play-one-game football action and a dynasty mode that lets you build a franchise through drafts and trades. Its variable difficulty levels make Fever accessible to veterans and newbies alike, and its simple, intuitive control is fast and forgiving. We also like Fever's presentation, a combination of impressive graphics and sound that comes together nicely with its straightforward play selection and game option interfaces.

There are a few things to nitpick, of course, including the fact that some

players (especially the linemen on both sides of the ball) look a bit more like beer-guzzling Michelin men than they should. That's not to say that there



Many of the players in NFL Fever 2003 look great (like Trent Green, shown here dropping back to pass), but the linemen tend to look a little too thick and ponderous. (The offensive lineman to Green's right dwarfs William "The Refrigerator" Perry.)

aren't some hefty guards and tackles in the NFL, but in Fever they look a bit too thick, and they often move awkwardly on-screen.

The other thing we weren't crazy about this year was the substitution of play-by-play announcer Kevin Calabro for last year's announcer, Dick Stockton. Calabro shows that he knows his way around the broadcast booth but adds a little too much "attitude" compared to the play-by-play men we're used to. (Did you ever hear Pat Summerall shout "Hammertime!" when someone got tackled?) The net effect is like having two commentary guys in the booth (Ron Pitts comes back with another strong showing this year), and it gets a little distracting.

The game's weaknesses aren't glaring flaws, though, and for the most part, it's a lot of fun to play. And combined with its other assets, the ability to play online using Microsoft's Xbox Live service (Madden 2003 for Xbox doesn't support online play) makes it an attractive choice for Xbox owners everywhere.

NFL Fever 2003 (Xbox)

\$49.99

Microsoft

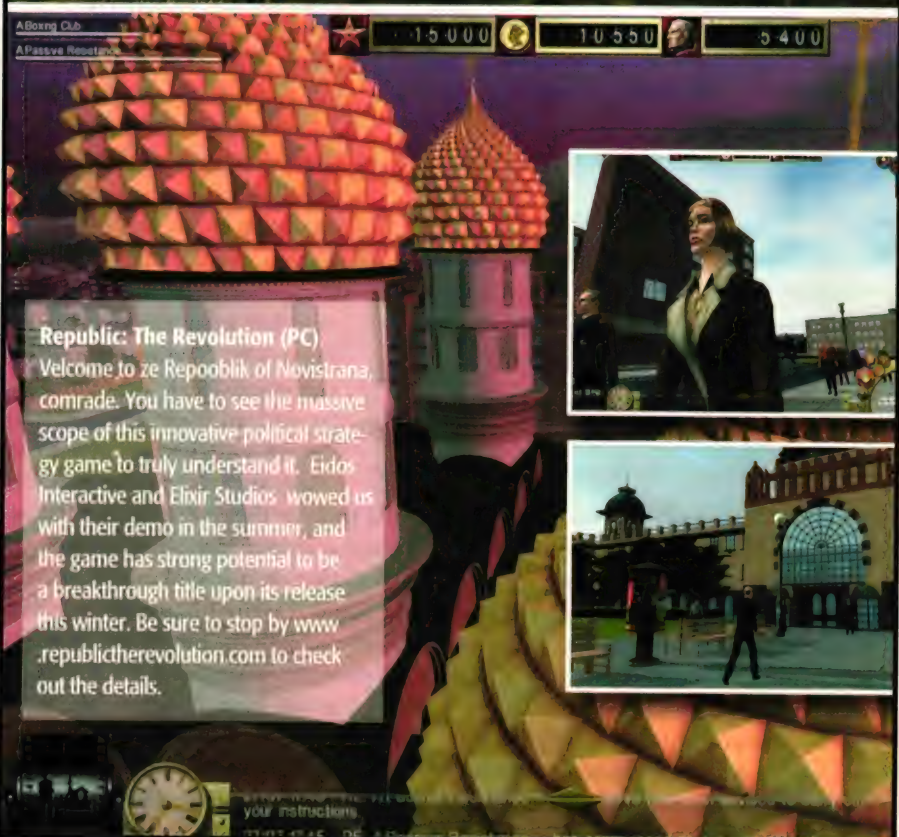
www.xbox.com/nflfever2003

Hot Shots: The Beauty Of The Game

Yeah, we know it's all about the gameplay. Sure, there are those who would have you believe graphics are relatively unimportant in the greater scope of things, but if you read *CPU* mag, you probably already know those folks are off their collective rockers. We want great gameplay combined with stunning graphics, and here are two upcoming games that show promise. Watch for them.



The Lord of the Rings: Fellowship of the Ring (PC, Xbox). These are from the PC game due in stores later this year. Vivendi Universal Publishing is working on titles based on the books (PC and Xbox) while EA is developing console games based on the movie license.



Republic: The Revolution (PC)

Welcome to ze Repoooblik of Novistrana, comrade. You have to see the massive scope of this innovative political strategy game to truly understand it. Eidos Interactive and Elixir Studios wowed us with their demo in the summer, and the game has strong potential to be a breakthrough title upon its release this winter. Be sure to stop by www.republictherevolution.com to check out the details.

Infinite Loop

Houston, We Have A Problem . . . With The South Atlantic

In the future, space tourism might involve more ordinary citizens than pop stars and eccentric billionaires. But if you plan on taking an orbital trip or two around the globe, you may want to leave your notebook at home, or at least make backups before lifting off.

Why? Background radiation in space can introduce random errors into a computer system. Areas around the poles and an area over the South Atlantic known as the SAA (South Atlantic Anomaly) are particularly notorious for causing computer hijinks. The SAA has wreaked havoc with some of Hubble's electrical equipment, forcing operators to shut down high-voltage systems when the satellite passes through them. Before it got rolling on the international space station, NASA even tested IBM ThinkPad 750ED systems in Mir to ensure they could withstand life in space. On the bright side, maybe the radiation will get hold of your friend's digital snapshots, and you won't have sit through a boring space vacation slide show.

Sources: Test of Portable Computing System (TCPs) Hardware, Discovery Online, Hitchhiker's Guide to the Hubble



SOFTWARE TIPS & PROJECTS

Office XP Hijinks

IT IS ONE OF THE MOST COMMON PRODUCTIVITY PACKAGES AVAILABLE AND PROBABLY PRESENT IN MOST WORKPLACES, BUT MOST PEOPLE BARELY SCRATCH THE SURFACE OF

what Microsoft Office XP Professional can do. This month we offer a small trove of tips about how you can talk to Office (and even have it talk back), manage a single email account in Outlook across two or more computers, and even make quick family photo albums in PowerPoint.

Talk To Office

One new feature of Office XP that people easily forget is speech recognition. This is a great way to discover whether a voice interface is right for you without investing in a pricey package such as Dragon NaturallySpeaking. All you need is a microphone and your original Office XP installation discs, and you are ready to dictate documents in Word or even reply to emails without lifting a mouse finger.

Word is the best starting point because it has the most robust voice-recognition support, although in most cases, you will need to install the voice-recognition modules from the original XP discs. From the Tools menu, choose Speech, and Office will either prompt you for the disc or initiate the voice-training tutorial, which is where the program learns your voice and cadence.

Adjust your mic. A quick hardware tip about microphones is in order. You

can use any microphone for this, but headsets really work best because they maintain an even volume for the program. Microphones often are not set up properly in XP, so the first test in the speech recognition training session is likely to fail. First check XP's Audio Properties dialog box to ensure the MIC

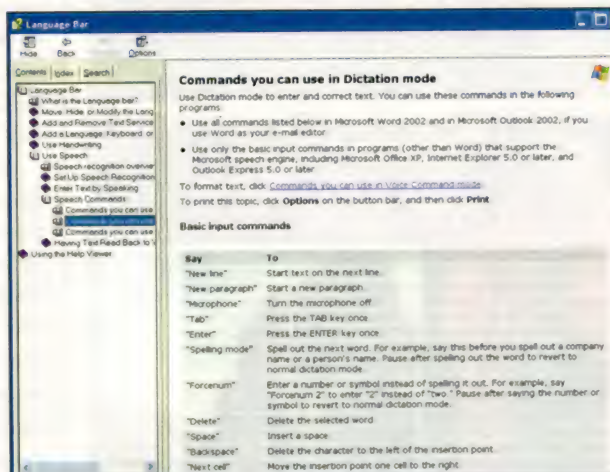
Finally, choose Audio Input from the Speech Properties dialog box and click Volume to set the recording levels at a medium level so that your breathing does not register on the audio gauges but your words do. High recording levels tend to pick up stray typing sounds and breathing and translate them into a chaos of words and commands you don't want.

Once you complete the voice training, you are good to go in all Office apps. A Language bar appears at the top of the screen. Clicking Microphone activates the two speech modes: Dictation for transcribing word, and Voice Commands for operating typical menu and command functions. Switch between the two modes either by using the menu buttons or saying "Dictation" or "Voice Command," respectively.

Talk normally. First-time users of speech recognition act like boorish American tourists in a foreign land. They think that by speaking slowly and loudly anyone should understand English. In fact, the speech algorithms recognize words in context better than they recognize slow pronunciations of single words. Saying formatting commands such as "quote" or "paren" and "close paren" too slowly will insert unwanted spaces after the punctuation. To

avoid this, say the command and dictate the text at an even clip with no breaks.

But what are the spoken commands? For some reason, Microsoft included speech recognition but didn't make it easy to learn. With speech mode turned on, go to the Help menu on the Language bar. In the Contents tab, click the Language bar, Use Speech, and then Speech Commands to find formatted



What do you say to Office XP's speech recognition program? Dig around in the Language bar Help file to find common voice commands.

channel is not muted. Also, Office's speech module puts a new menu bar at the top of your screen that controls the speech recognition operations. Go to its Tools menu and choose Options to access more details about the MIC properties. The bottom section in the Speech Properties dialog box is where you can check the configuration of your MIC input and whether it is working.

lists of commands. Right-click to find a Print command for these screens; they print out for future reference. You will need this guide for the Dictation mode commands for formatting and editing. When it comes to general commands, the rule is that the program recognizes the name of the command as it appears on the menu, so saying "Save as" or "Draw table" will work. You can also access any of your toolbar functions by using that button's name, which you can discover by mousing over the button.

Office Talks Back

Even if you don't have a microphone (or prefer not being caught in the embarrassing state of talking to your computer), the speech recognition module also enables Office XP's text-to-speech power. Yes, now your PC, too, can sound like Stephen Hawking. With the Language bar in place, go to Options and click Speak Text. This adds a Speak button to the Language bar. Either select the text you want your PC to read or place the cursor in front of the text you want to hear, then click Speak.

The text-to-speech feature is most useful in Word and has only limited support in other Office programs. For instance, in Outlook, where it would be so cool to have your email read to you,

the Speak button only works on email you are composing in a new message or a reply. It won't work on text in the Inbox. Microsoft's documentation claims that better text-to-speech support may be coming in Office XP updates.

There are several voices available in text-to-speech mode. To try out a few, choose Options from the Tools menu on the Language bar. In the Text To Speech tab, you can pick from three computer-generated characters named Michael, Michelle, and Microsoft Sam in the Voice Selection drop-down list. Want more? Microsoft has a White Paper dedicated to Office's speech recognition functionality. Go to the Knowledge Base of MS's support site (support.microsoft.com) and type the document number Q304860 in the search box to download the document.

Master Menu

In most programs you probably have a handful of commands you use regularly, but the top-line menu structure of Windows makes you rifle through multiple categories and choices to get to them. Instead, you can make a master menu for any Office program that contains only your most commonly used commands.

Choose Customize from the Tools menu. In the Commands tab, click New

Menu in the left pane. Click and drag the New Menu item that appears in the right pane up to the toolbar or menu line of your choice. Right-click this New Menu button to rename it as you like. Back in the Customize dialog box, you can click almost any of the command categories in the left pane to locate the specific menu commands you want in the right. Then just click and drag the commands you want into your newly formed menu.

Outlook X2

Home networkers often run into the problem of the clashing email clients: Once you read a message from your Inbox on one PC, it no longer comes up as new mail when you go to the other. We've come up with a cure using a simple switch nestled deep within Outlook. This tip applies to most versions of the client, by the way, not just Outlook 2002 in Office XP.

First, designate one of the PCs you work on as the master desktop, the one that will always receive all mail and will be the one that deletes a message from the email server when you read it. The other PCs that access the same email account will be able to read any new messages that you haven't read on the master desktop but will leave them on the email server to be received as new messages later by the master desktop.

In Outlook on the master desktop, choose E-mail Accounts from the Tools menu and click the View Or Change Existing E-mail Accounts radio button. Highlight the account name, click Change, and then click More Settings. In the Internet E-mail Settings dialog box, click the Advanced tab. In the Delivery section, make sure that the Leave A Copy Of Messages On The Server box is *unchecked*. This tells your mail provider to delete messages from its server when you read them on your master PC.

On your networked PCs, go to this same dialog box, but this time put a check in the Leave A Copy . . . box. This tells the email server to let you read new messages from these PCs but retain the mail on the server so that you can download and read them again on your master

Registry Tweak

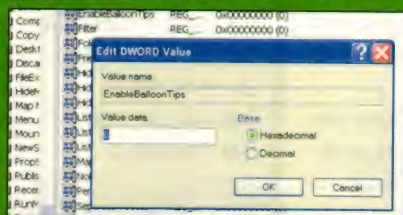
Balloon Busting

One of WinXP's most irritating habits is displaying balloon tips and reminders on the Taskbar. As if Microsoft decided to become, well, your mom, the OS uses these "Notification Area Balloon Tips" to nag us about software updates, joining .NET, and anything else Mother Gates decides we need to know about the wonderful world of

Microsoft. To pop these irritants once and for all, access the Registry Editor and find the HKEY_CURRENT_USER\SOFTWARE\MICROSOFT\WINDOWS\

CURRENTVERSION\EXPLORER\ADVANCED key. Right-click in the right pane to make a new DWORD Value that you name EnableBalloonTips.

Set the Value to "0." Of course, if you are a balloon freak or just miss all of those messages, the "1" value enables the feature. These changes require a reboot to take effect. ▲



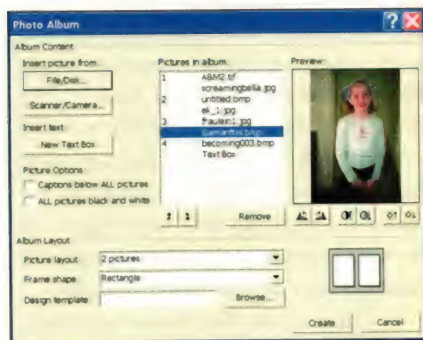
Set the EnableBalloonTips Value to "0" in the Registry Editor to eliminate those pesky pop-up reminders from the XP Taskbar.



desktop. Before closing this dialog box, use the checkboxes at the bottom to designate a time limit for keeping read messages on the server. In our home network setup, we are checking email constantly on numerous machines, so we keep the read messages on the server for only a day. But this is also a good technique for travelers who access their email accounts directly while on the road but who want to have those messages available back at home. Set the "keep messages" time frame for the length of your trip, and the server will keep the messages fresh for reviewing later at home.

PowerPoint Photo Albums

You can make a quick and easy photo album in PowerPoint that you can distribute to friends and family and that anyone can play with the free PowerPoint Viewer (office.microsoft.com/downloads). Rather than create separate slides in the normal view, go to



You can construct an entire photo album from this single box in PowerPoint, including adjustments for image appearance, image order, backgrounds, and format.

the Insert menu to click Picture and New Photo Album. You can construct the entire album from here. Use the File/Disk button to open your file list, which can import most file types.

Don't miss the available option for formatting the project on this screen. Drop-down menus below adjust the number of photos on a page and the shape of their frames and even make available all the usual PowerPoint templates. The little arrow buttons beneath the Pictures In Album area let you

WinXP Tip Of The Month

Change Your Priorities

Want to make sure that CD writer is getting as much processor juice as it can while burning a disc in the background? You can make XP devote more time to specific processes running in the foreground or background by going to the

Task Manager (CTRL-SHIFT-ESC). Look for the relevant executable program under the Processes tab, right-click it, and choose Set Priority. You get six options with which to play here, and by default, everything is set to Normal. You

can increase the processing priority of the application of your choice or reduce others. You might want to avoid the ultra-high Realtime setting, however, as that will likely bring virtually every other process to its knees. ▲

highlight and reorder the images, and the image adjustment buttons to the right will alter contrast and brightness or reorient the image. Back in the normal PowerPoint editing screen, you can reposition photos and add all of the clever effects PowerPoint has to offer. By default, the album maker labels each image with the file name. Click this text to change or delete the labels.

In order to make global changes or add new photos to the album once you are back in the editing screen, use the Photo Album command in the Format menu to recall that same album creation window.

menu now on the toolbar will let you add current, saved documents to a drop-down menu of documents that will be a button away.

To remove a file from the Work list, press and hold the CTRL-ALT-Dash key combination, which turns your cursor into a thick dash. Go to the Work menu and click the file you want to delete from the list. **CPU**

by Steve Smith

Files At Your Fingertips

The recently opened files list in Word is great for returning to the last few documents you worked on, but there are also a lot of documents you may not have accessed in the past few days but still want to keep on hand. For this, Word offers the Work button. The Work button, you say? Never saw it. Well, you need to dig to find the feature and install it on your toolbar.

Choose Customize from the Tools menu. In the Categories window, highlight Built-in Menus. In the Commands window, click and drag the Work command onto whatever toolbar you prefer. The Work

Infinite Loop

Shed The Pounds

In 1949, *Popular Mechanics* said, "Computers in the future may weigh no more than 1.5 tons." Uh, yeah. Fast-forward 53 years to the present, when you can purchase a notebook computer that is one-thousandth that size. Computer manufacturers release thinner and lighter notebooks every day. Here are five skinny examples:

Product	Weight	Thickness
Sony VAIO PictureBook	2.2 pounds	1 inch
Toshiba Portege 2000	2.6 pounds	0.6 inches
Sharp PC-UM10	2.9 pounds	0.65 inches
Dell Latitude C400	3.6 pounds	1 inch
IBM ThinkPad X	3.6 pounds	1.2 inches

What will the future bring? Assuming computers in 2055 are one-thousandth as big as they are now, we'll buy a computer that's approximately one-fourth the thickness and weight of a sheet of paper.

You just stepped off the plane, yet
you can't wait to sit down again.



The Lincoln LS at Hertz.
The luxury car you're yearning for is now part of
the new Hertz Prestige Collection.

Rent the Lincoln LS and sit in the lap of one of the
luxurious performance vehicles included in the new Hertz
Prestige Collection. Simply reserve the one you want
(available at select U.S. and Canadian locations) for your
next business trip or vacation. For reservations, call your
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WARM UP TO PENGUINS

Get To Know Your Network Traffic

IN SEPTEMBER'S ISSUE OF COMPUTER POWER USER, WE PRESENTED TIPS FOR WATCHING YOUR LOG FILES FOR INTRUDERS. THIS MONTH, AND IN MONTHS TO COME, WE DELVE

into more Linux issues and projects. This month, we focus on being aware of your network's traffic.

Ever get the feeling anyone could be doing just about anything on your network and you wouldn't know about it? Some things are obvious, such as someone watching a streaming movie that's devouring bandwidth. But what about the things you don't notice?

To keep tabs on what's going on, you should be monitoring your network traffic. There are various tools in the Linux world to help accomplish this, but one of the more popular is IPTraf (available at cebu.mozcom.com/riker/iptraf).

Some Linux distributions bundle the program. (See IPTraf's home page for the most recent availability listing of the program.) IPTraf not only can tell you how much traffic is traveling over your network, but also what kind of traffic it is, what host machines are involved, and more.

Protocol Terminology

It helps to know a bit about the abbreviations you're likely to run into concerning TCP/IP network traffic. Services on the Internet—Web, FTP, IRC, and more—utilize a protocol or the language spoken between computers to make a service run, such as HTTP or FTP.

Beneath these individual service protocols are essentially a few Internet protocols. The major players here are TCP, UDP,

and ICMP. TCP is used for sustained connections, such as sending an entire file through FTP. UDP is used for connections that don't need to be sustained, such as sending a request for a Web page. The only response to this request really is sending that Web page, so a sustained connection isn't needed. ICMP is the little protocol behind ping, among other things.

Other protocols IPTraf recognizes include IP, IGMP, IGP, IGRP, OSPF, ARP, and RARP. IGMP is utilized for managing multicast groups. IGP is an

address to a network card's physical identifying information. RARP does the reverse.

Run IPTraf

Once you've installed IPTraf, you run it by either typing `iptraf` at the command line or using `iptraf` with a combination of one or more available flags. You can get a listing of flags by typing `iptraf -h`. In general, it's probably best to start with typing `iptraf` until you're sure of which interfaces you want and don't want to monitor and what other options you want to set.

When you start IPTraf, you'll get an introductory screen first. Press ENTER, and you'll see the program (see Figure 1 for a visual representation of this). If you use the flags, you'll actually skip the menu and go directly to the features you request.

You're not actually monitoring traffic yet, however. To accomplish this, first use the Up and Down arrows to navigate to the IP Traffic Monitor menu and press ENTER. Here you'll need a general understanding of Linux and network interfaces. In Linux, `lo` refers to the "loopback" interface (meaning "this machine"). Also, Ethernet cards on the machine are referred to as `ethX`, where X is a number. The main Ethernet card will be `eth0`. A second card will be `eth1`, and so on.

Select either All Interfaces or just your Ethernet card using the Up and Down arrows and press ENTER. Now you're monitoring your network traffic. If nothing seems to be happening, try opening a Web browser and go to a Web page, or hop onto an IRC channel or Web forum. Entries should appear in your monitor window (see Figure 2 for a visual representation of this).

Reading IPTraf Output

The IPTraf monitoring screen has three major sections. The top section deals with

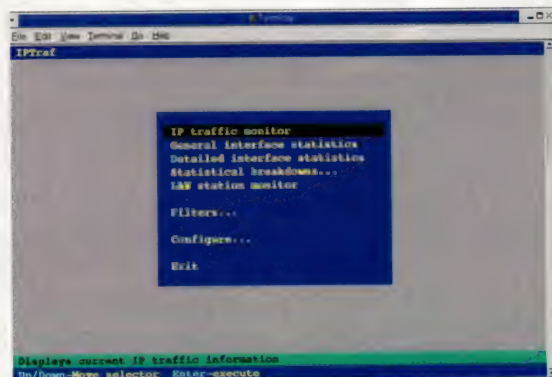


Figure 1. This image gives you an idea of what the main menu looks like in IPTraf, a program that can help you monitor your Linux network traffic.

umbrella term for protocols used to communicate routing information (where data that's going to particular addresses needs to go) internally in a large network. OSPF is one of the IGP family of protocols. IGRP is one of the methods routers use to trade information. Finally, ARP converts an IP

USB 2.0: Coming To A Linux Box Near You

If you're big into USB devices and speed, and you bought a nifty new machine that supports USB 2.0, you probably weren't too amused when you discovered that USB 2.0 isn't actually available in your favorite Linux distribution. Well, that's about to change.

In Linux kernel 2.4.19—the core of the operating system—the first hooks for USB 2.0 were installed. Now that the hooks are there, the folks who develop the device drivers have gotten to work. Let's hope that by the time you read this, there are working USB 2.0 drivers for Linux. ▲

the TCP transfers and shows what's being monitored in a series of columns. The following is a typical example:

```
192.168.41.5:80 = 765 4094 --A- eth0
```

Here, 192.168.41.5 is the IP address you're connecting to. The port you're connecting to is 80. Think of your Ethernet card as a post office and every port in it as a post office box. Every Internet service is assigned a default port. For example, 80 is the default port for Web servers. When you request a Web page, such as www.example.com, it's converted to a corresponding IP address. In this case, that's 192.168.41.5, and the port 80 is assumed.

The number of packets that have been received is 765, with a packet being a unit of data passing over the Internet. The next number, 4094, refers to the number of bytes that have arrived. Which leads us to the letters. In this example, this output is --A-. There are various status flags you can get with --A-. Some of the most common and their meanings include:

- S refers to a SYN packet, which is part of the hello handshake that occurs when establishing a TCP connection. S-A- refers to an acknowledgement of that hello.
- When you see an A alone, it means the handshake completed successfully.

- RESET means the connection is being started over again.
- DONE means the FIN packet sent at the end of the TCP connection was sent, but it hasn't been acknowledged yet.
- CLOSED means the process is done.

The next section of the monitoring screen deals with the UDP transfers and has a more compact and self-explanatory format. An example would be:

```
UDP (78 bytes) from 192.168.221.4:42 to 192.168.142.6:42 on eth0
```

At the bottom of the section, you'll see the summary statistics. This includes the length of time that IPTraf has been monitoring, the number of packets that have passed through, and the current rate of travel for TCP traffic.

Customize IPTraf

IPTraf has a number of customizable features. Reading the documentation at cebu.mozcom.com/riker/iptraf first is a good idea. Also, get familiar with your options if you intend to use the program regularly. We don't have the room here to get into all of the customizing options, but the goal is to point you to where you can find the spots you can customize IPTraf.

At the bottom of the network monitoring screen we discussed earlier, you'll notice you can navigate through the listings, plus press keys to do things such as enable more TCP information or sort through your TCP listings. If you press X to exit the monitor screen and return to the main menu, you can view any number of statistical breakdowns instead of raw data. You can also open the Filter section and select various items not to be counted, such as ARP and RARP requests.

Of course, most of the program's configuration settings are in the Configure menu. The left side displays the options, and the right side displays the current settings.

If you want to make serious, regular use of IPTraf, you need to select exactly what you want to monitor, use the appropriate flags, log the data that you're collecting, and more. The IPTraf documentation has information on how to accomplish this and more.

Once you can get these aspects working by hand, ensure that IPTraf always starts the way you want it to when your machine boots. You'll also want to ensure that it shuts down cleanly when you shut down your machine. Accomplishing this is beyond the scope of this article, and how you manage it depends on what distribution you're using. For more information, see your distribution's documentation on how to automate processes starting and stopping when your system changes runlevels.

Wrapping Up

IPTraf is quite useful for tracking your network's behavior. Becoming familiar with the usual patterns is just another way of learning how to spot unusual behaviors. Although you can't monitor each user's usage, you can monitor what and when

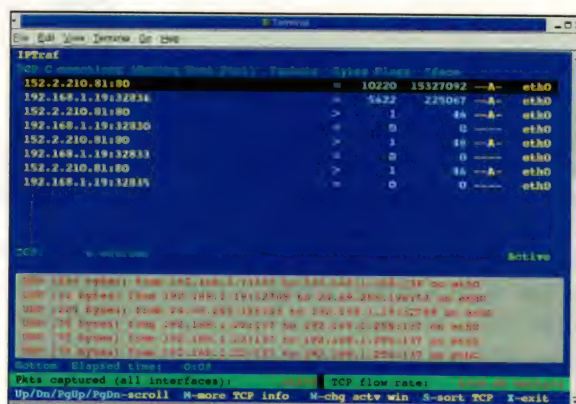


Figure 2. The example in this image details how IPTraf monitors all of a network's interfaces.

something was done and from where. You can also specifically filter for particular protocols, such as SMTP for mail, to see how much traffic a specific service is generating.

When you get IPTraf the way you want on one system, it's simple to duplicate the command line and other items on other machines. CPU

by Dee-Ann LeBlanc



KILLER HARDWARE TIPS

Too Cool To Follow Rules

IF YOU'RE A USER WHO CAN'T LEAVE THINGS ALONE IF THERE'S A CHANCE YOU CAN MAKE THEM BETTER, EVEN IF IT MEANS BUCKING THE NORM, READ ON. WE HAVE SOME TIPS

and tricks that just might make you more productive.

Rev Up Your CD-RW

You overclocked your CPU and video card, but what about your CD burner?

Hardware hackers have discovered that several CD-RW drives from Lite-On use the same hardware but are sold as multiple models with different max writing speeds. The only difference in the models is the firmware, which limits the top speed of less expensive drives. By upgrading the firmware, users can make a drive read and write more quickly and enable other features.

The hack works with every Lite-On brand drive, plus manufacturers' drives Lite-On manufactures, says Jan Willem, Webmaster of CDFreaks.com. These may include drives sold with Iomega, Plextor, Ricoh, Sony, Verbatim, VisionTek, TraxData, TDK, and other brand labels.

A list of hackable drives and upgrade procedures is available at www.cdrinfo.com/Sections/Articles/Specific.asp?ArticleHeadline=Overclocking&Series=0. An extensive FAQ that's worth reading is at club.cdfreaks.com/showthread.php?s=&threadid=42344. The hacking process varies from model to model, but it generally involves using a flashing utility to load new firmware onto the drive, a simple process that takes only a few minutes.

"A lot of drives can be upgraded, but most of them are actually Lite-Ons. In the past, HP drives could be upgraded, and currently upgrades for LG drives are available,"

says Willem. If your drive isn't listed, you're out of luck, but watch for future upgrade possibilities. "It's likely that it is also possible to do this with other drives," says Willem.

"We have a strong belief Lite-On drives have become more popular because of the



Lite-On branded CD burners, and drives that company manufactures, are popular with hardware hackers because they are easy to speed up with new firmware.

overclocking thing. We think they never thought about someone doing something like this; we expect that drive manufacturers will limit this in the future," says Willem.

Installing an unauthorized firmware upgrade will void your warranty, and if the firmware isn't a perfect match for your CD burner, it could reduce its reliability or kill the drive. Carefully inspect your drive to make sure it's truly an upgradeable model. For example, some companies sell drives using mechanisms from several manufacturers, so two drives might seem identical, but one might be upgradeable and one not.

Never attempt to upgrade a drive with firmware that assumes a different hardware maker or chipset.

Software, such as Nero InfoTool (www.cdspeed2000.com), can identify your drive and its firmware version. Nero CD Speed 2000 (same URL) will benchmark its speed before/after a firmware upgrade.

If your CD writer is already fairly fast, upgrading can shave a few seconds off the burn time, but don't expect miracles. If your 24X writer burns a CD-R disc in five minutes, it might take 4:30 minutes at 32X—hardly an earth-shattering difference. Increasing the drive's read and burn speeds can be just the tip of the iceberg, though.

"The overclocking does not only change the speed of the drive but also the writing strategy. For example, an upgrade can make the drive switch from using Z-CLV to CAV," says Willem.

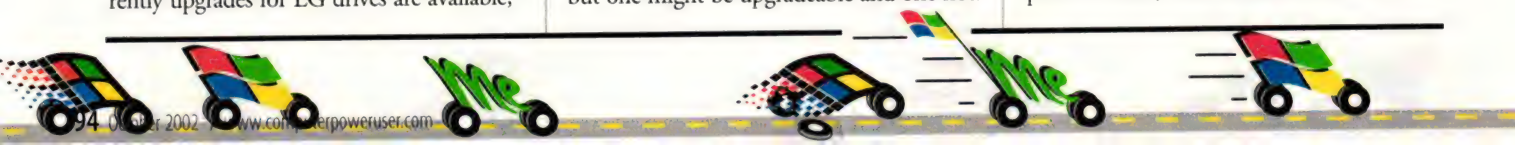
Z-CLV (zone constant linear velocity) means that the writer starts at one speed, then speeds up as it transfers large amounts of data. With the CAV (constant angular velocity) burn mode, the drive takes less time to reach its maximum speed.

"So the overall speed increases more than just the few seconds you would assume looking at the numbers," Willem says.

The Lite-On hack also adds support for Mt. Rainier, a specification that aims at making CD-RW operation more like a floppy drive, with quicker formatting and support for UDF (Universal Disk Format).

Are discs burned at hacked speeds reliable? "We strongly believe that drive manufacturers know their limits. 48X writing speed in combination with good media does not give any worse results than slower writing speeds," says Willem. "The upgraded 32X should produce the same quality CD-Rs as the 48X Lite-Ons." Be sure to use media rated for the speed you're burning at.

Surprisingly, perhaps, Lite-On seems pretty relaxed about the hack. "From our point of view, what hackers do: Don't ask,



don't tell," says Esteban Kim, Lite-On marketing manager. "We are aware it is going on, but it is hard to stop people from doing it. It is tough to enforce from a practical standpoint."

"We don't recommend people do this," he adds. Although the hardware may be the same, drives haven't been tested at speeds higher than their maximum speed rating and may fail once upgraded.

"It should work.

But if you're going to tweak with that thing, you void the warranty," says Kim. "You gain the benefit of the technology, but you need to be aware that you might be burned."



A V.92 modem will give you the greatest possible oomph from a phone-line connection to the Internet.

V.92-rrooom!

Broadband Internet is great if it's available and you can afford it. But many users still must slog along with analog modems. If you're such a user, it makes sense to have the fastest modem possible. Today, that means utilizing the V.92 protocol.

A V.92 modem has four new features available when communicating with a compatible ISP, including Modem On Hold, PCM Upstream, Quick Connect, and V.44 Compression.

V.92's raw download speed isn't faster than a 56K (V.90) modem; both have a max download rate of about 53Kbps. V.92 modems include V.44, though. This compression protocol lets more text and HTML data download at once.

With Modem On Hold, or Internet call waiting, if you get an incoming call while you're online, a window appears on your



Nero InfoTool can reveal the sundry details of your CD-R burner, including model and firmware information.

screen letting you know you have a call. If you take the call, the modem puts the ISP on hold for a few minutes (the ISP sets the maximum time). After you hang up, you can then resume the Internet connection unperturbed. The feature requires special software, but modem makers have only released this software for Windows.

PCM Upstream digitally encodes data the modem sends, increasing upload speeds from 33.6Kbps to 48Kbps in V.90 modems.

Quick Connect reduces the time it takes to log in to about 12 seconds. The first time the modem connects to the ISP, it memorizes information about the connection. For future calls, the modems establish the connection more quickly using this information.

If you use a V.90 modem, check the manufacturer's Web site for a flash upgrade to V.92.

The V.x naming convention and underlying protocols originate at the ITU (International Telecommunication Union; www.itu.int), which coordinates telecommunications networks and services. Protocols starting with "V." are standards for data communication over the telephone network.

V.92 modems have been on the market for more than a year, but large ISPs have been slow to add the hardware necessary to support it. We asked AOL, MSN, EarthLink, and Worldnet about their support for V.92. None have committed to supporting it. However, the dial-up network providers these companies use are slowly migrating to V.92, so users in some cities have found unpublished or unofficial V.92 dialups. Local and regional ISPs may be a better bet if you're looking for a guaranteed V.92 connection. Modemsite.com offers a list of ISPs that support V.92 and whether each supports V.44 and PCM Upstream protocols.

Even if an ISP supports V.92, its support for the PCM Upstream and Modem On Hold features is optional. Check if they are offered before signing up. **CPU**

by Kevin Savetz



Infinite Loop Hard Drivin'

We've all heard the jokes: If Microsoft made cars, they would run slower on old roads and sometimes crash for no reason. Here's a crash course on the parallels between safer car design and Windows.

- 1965** Ralph Nader's "Unsafe At Any Speed" points out the Chevrolet Corvair's safety shortcomings.
- 1967** The National Highway Safety Bureau mandates seat belts in all seating positions in new vehicles.
- 1969** Ford introduces rear-antilock brakes; Chrysler puts them on all four wheels in 1971.
- 1978** The National Highway Traffic Safety Administration (formerly the NHTSB) issues bumper standards for low-speed collisions.
- 1998** New passenger cars have mandatory driver and front-passenger airbags; light trucks require dual airbags in 1999.

- 1992** Dr. Watson comes standard in Win3.1.
- 1996** Symantec offers a free version of Norton CrashGuard for Win95.
- 1998** Wildfile releases GoBack, which rolls back a Windows system to a previous state.
- 2000** WinMe comes with System Restore.
- 2001** WinXP protects its system files and makes it more difficult for users to install uncertified drivers (drivers licenses, anyone?).

Sources: NHTSA, Insurance Institute for Highway Safety, Microsoft, Symantec.

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ONE ROTTEN APPLE

A Case That's Fallen A Long Way From The Tree

NOT LONG AGO, YOU HAD THREE BASIC CHOICES FOR A COMPUTER CASE: LARGE BEIGE, MEDIUM BEIGE, AND SMALL BEIGE. NOT

exactly exciting. About two years ago while browsing a favorite forum, I saw a picture of "The Unreal Case" crafted by someone known as "Ultragooy." Little did I know I was witnessing the birth of case modding.

That very afternoon, I set out to convert my ugly beige box into something that would turn heads and cause a stir at any LAN party. Back then, the small case modding community was forced to convert parts and materials used for home improvement and auto body work and customizing to achieve the personalized cases now considered the roots of the case-mod movement.

Today, case modding is becoming big business, with most PC stores carrying rounded cables, light kits, specialized grills, and other accessories early modders could have only dreamed of. The original idea was to showcase the PC's guts (high-end components power users are most proud of), while creating a personalized, show-quality case at the same time.

The movement's influence has trickled down to manufacturers of these high-end parts, including video card makers using flashy heatsinks, motherboard makers licensing and trademarking specific PCB colors, and other improvements specifically designed to accentuate the components'

look. There are now even online stores dedicated to supplying case modders with everything needed to create the perfect case, from special screws to complete kits for newbie modders.

Although some absolutely amazing cases have been built, the limiting factors have always been the myriad of possible parts that need to fit inside a PC (forcing



The patient in its stock Apple G4 colors.

modders into a sort of generic enclosure) and the limitation of what modders can do in their garages and basements.

Some modders have broken through these constraints, though, producing original designs using nonstandard PC enclosures, such as microwaves, baskets, heating ducts, and other bizarre items. However, a garage case modder can't

really create the customized artwork-type cases that come from companies like Apple.

Apple's G4 line has always been considered one of the best-looking cases ever created. So when Kyle Bennett of HardOCP.com came to me with the idea of converting a G4 case into a functioning PC, I was immediately interested. Kyle acquired a gutted G4 case recently that had been placed on a shelf in Ireland several years ago. The case was never used, and it actually still had the protective, plastic sheeting on the gloss surfaces. This was going to be fun.

The Plan

Before I could tear into the case, we needed to plan what we wanted to put in it and what it should look like. This G4 was to become Kyle's LAN box, so using the familiar HardOCP.com black and maroon colors (similar to those used on the original Hard|Box I made for Kyle sometime back) seemed like an obvious choice.

The CPU needed at least a 2GHz chip, and because this would be a LAN box, it needed a top-of-the-line video card, plenty of storage space, and a fast burner. We decided the case would retain the G4's look and feel, but with a better color scheme. We also wanted our mods to let the PC components be as stealthy as possible and leave the ability to swap parts for future upgrades. We also decided on a name for the mod (all case mods should have a name): The Rotten Apple.

The Components

Our final machine had to be a high-end computer capable of playing current

games, plus those on the horizon. It needed lots of storage space for multiple-installed games, a fast CD-R/CD-RW drive, high-end and fast processor, lots of memory, and enough expansion for sound, video, and network cards.

The most critical component was the motherboard. Finding one to meet our requirements was difficult. I quickly discovered only a micro-ATX board would fit in the allotted expansion card slots, and the board couldn't have an audio riser onboard.

We initially selected a VIA reference KT333 board, but we quickly determined that the location of the memory slots interfered with the CD-ROM cage. After

choice; it was then the state-of-the-art in 3D graphics and more than capable of supporting any current game. Plus, it could support anything coming in the next several months. Considering VisionTek's excellent reputation, this was the easiest decision we made.

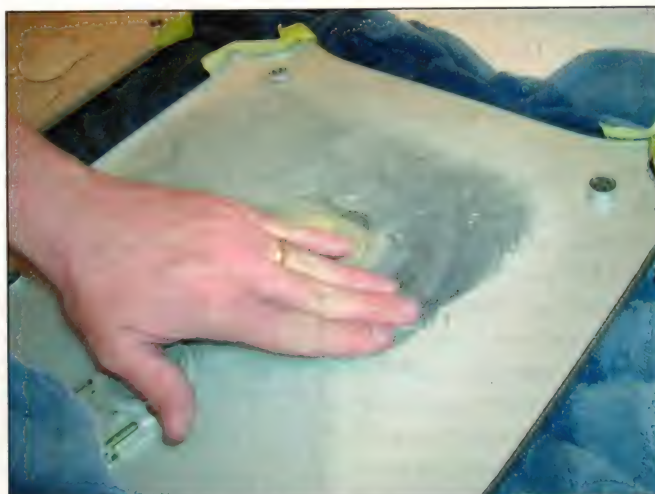
At LAN parties, 100Mb speeds are the standard, but Gigabit Ethernet is right around the corner. We decided on an Intel 10/100/1000 NIC for any possible connection at a LAN party. For sound, we decided on a fairly simple card. Because most LAN-party gaming is done with headphones, a high-end, surround-capable card would be massive overkill. We chose a Philips Rhythmic Edge card.

painting. I decided to make the silver side panels maroon and the translucent blue plastic top, front, and back panels black. For the black parts, I simply painted the back of the panels with black paint to make them a very dark purple. This would appear black in anything but direct sunlight.

The side panels were more difficult, as their backs were coated with tough, silver paint. They also had blue Apple logos glued into recessed slots on the outside. I tried several thinners in an inconspicuous area on the paint, but to no avail. I did find an account on the Web from a user who painted his G4 and discovered soaking the panels in



This is the G4's internal frame for all of its plastic bezels.



This image was taken after about two hours of soaking the panels in rubbing alcohol. Take care not to rub too hard and scratch the plastic.

extensive searching, we determined a board that could meet our exact needs didn't exist. The closest match was the EPoX EP-8KHM, which had the memory slots in the required location. However, it would require removing the audio riser and relocating three capacitors next to the memory slots. Because the board fit the case and is designed for the AMD XP line, an AMD XP 2200+ chip was the logical choice. The EPoX board required DDR memory, so we chose a stick of 512MB Corsair PC2700. For CPU cooling, we acquired a Cooler Master all-copper HSF.

For the video card, a VisionTek Xtasy GeForce4 Ti 4600 board was the obvious

For the rig's storage, we chose twin Western Digital 120GB drives for their reliability and high capacity. We settled on the VisionTek Xtasy 48X CD-RW for the CD drive; it provides blazingly fast CD burns.

Our final decision was a removable media drive. The G4 was originally equipped with only a Zip drive and no floppy. Rather than attempt extensive mods to the front-case bezel for a floppy drive, we elected to stay with a Zip drive, choosing an internal Iomega Zip 250.

Step 1: Painting

The first major obstacle was removing and painting the G4's plastic pieces for

rubbing alcohol for several hours completely removed the paint. The only remaining issue was getting the logos off. After some experimentation, I found pouring alcohol around the logo, with some gentle prying with a plastic putty knife, loosened and removed the Apples. After applying masking tape to create a dam around the panels, I soaked the panels in the bathtub.

Three hours and two ruined towels later, the paint was mostly gone. The corners and a few recessed areas still had paint. I used an old toothbrush and a paint gun (as a parts cleaner) to remove all traces, leaving a perfectly clear panel. Some careful masking and a bit of surface



After soaking and sanding, what remains are two side panels that are completely clear and ready to be repainted.



Wet sanding the Apple logos will help remove any ridges that are left after removing the paint from the panels.

preparation brought me to the all-important painting stage.

Some time ago, I switched to automotive-grade acrylic enamel for mods; it creates a hard, durable finish that looks as good or better than a new car's finish. I use PPG DAR acrylic enamel, which consists of three parts: the color, reducer, and hardener, all mixed in a particular ratio.

Once properly mixed, the paint goes on with a very glossy finish that should last for years. Painting with acrylic enamel is costly and difficult. Although the process wasn't really necessary for this project—all the inside surfaces were painted—getting the exact maroon color would be difficult using anything else.

In addition, acrylic has a much better drying time.

After shooting the pieces, it was a matter of waiting (and praying) to make sure the paint's lacquer didn't haze the plastic. An hour later, I removed the masking to reveal a perfect maroon panel. The finish looked far better than I had hoped, and I was excited to get the panels next to the black pieces.

Most of the blue plastic pieces required no preparation because they were translucent blue plastic, but the Apple logos for the side panels were a different story. They were already coated with a silver paint on the back to reflect the blue color. Unlike the side panels,

this paint wouldn't come off with alcohol. I would have to sand them.

Using a belt sander and 120-grit paper, I removed the majority of the paint. I followed that by wet sanding with 300-, 600-, 1,000-, 1,500- and finally 2,000-grit paper. Then I taped sheets of the higher grits to a piece of glass for a flat sanding surface. At about the 600-grit level, the smooth plastic/water combination began to make it difficult to hold the logos. A late-night trip to the local superstore turned up some suction cup picture hangers that I attached to the Apple logos to hold them.

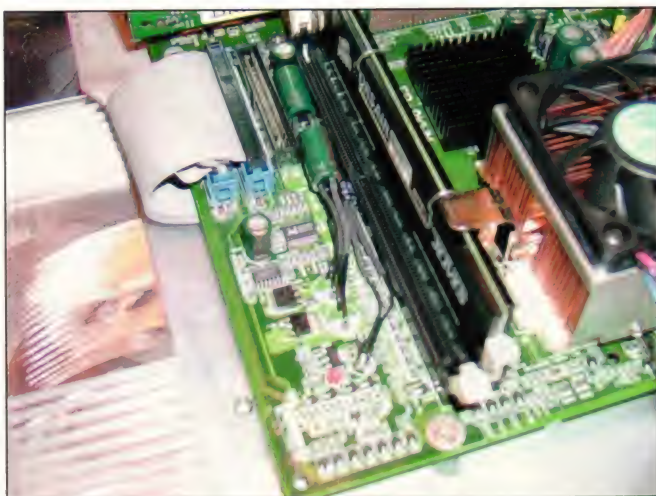
Using 2,000-grit paper, I had two smooth, paint-free apples and stems ready



After painting the panels black, they are ready for reassembly.



Here you see the motherboard as Apple supplied it. The items circled in red are components that had to be removed or relocated.



This image shows the offending capacitors after they have been moved to their new home in order to get the board to fit in the case.



Spraying the surface with silicone conformal coating prevents the sanded spots from rusting and also makes the surface nonconductive.

to become Rotten Apples. I masked the blue-plastic pieces, working methodically and carefully to ensure a tight seal so the paint didn't leak underneath. Make sure to use quality tape, such as 3M's line of painter's tapes. In addition, cover the backsides of objects you're painting to prevent over-spray.

After mixing the black paint and shooting the panels, I needed to wait overnight to give the panels time to dry. The next morning I removed the masking tape to find dark-purple to nearly black case panels. The panels looked spectacular next to the maroon side

panels. It was now time for the hard work to begin.

Step 2: Motherboard Mounting

After some delicate soldering work to remove the audio riser and reposition the offending capacitors, our motherboard was ready. It was time to fit it into the case tray.

To make the work easier, I drilled out the pop-rivets holding the motherboard tray to the hinge and removed the tray from the case. I used the original VIA motherboard as a template and looked at the existing standoff locations.

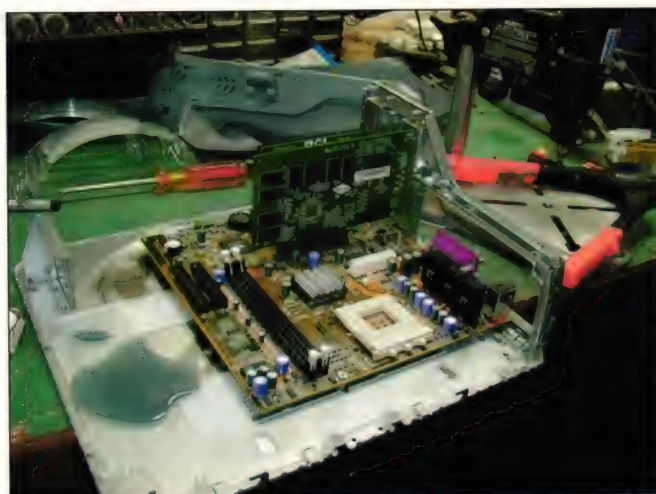
Unfortunately, none of the existing standoffs were in the correct location. I needed to remove them all.

Using a Dremel and a high-speed air sander, I quickly disposed of the offending standoffs. Using the motherboard as a template, I marked locations for six new standoffs. Three would interfere with the case side-locking mechanism, and clearance was needed for the plastic sheet so that it still moved freely. I created the clearance slots with the Dremel (a modder's best friend).

Then, it was a matter of precisely marking the locations for the new



The black ovals in this image indicate the material that needs to be removed in order to provide clearance for the lock plate to move after the new standoffs are attached.



Before attaching it permanently, we need to test-fit the template motherboard on the tray.

standoffs, drilling and tapping the holes, and mounting the new standoffs. I applied silicone conformal coating to the tray to prevent rust and any accidental shorts. Six screws later, the motherboard was firmly mounted in the case tray. On to the power supply.

Step 3: Wiring

I thought this part of the mod would be the easiest, but I was sadly mistaken. Although the PSU fit comfortably where the original Apple supply fit, there was little room for the wires and barely an inch of clearance behind the CD-ROM. The supply wires—specifically the ATX power connector—were woefully short.

motherboard. Cut and reattach one wire at a time, matching the pin locations from the extension to the original, as the wire colors don't always match. If at all in doubt, consult an electronics repair technician or electrician to perform the work.

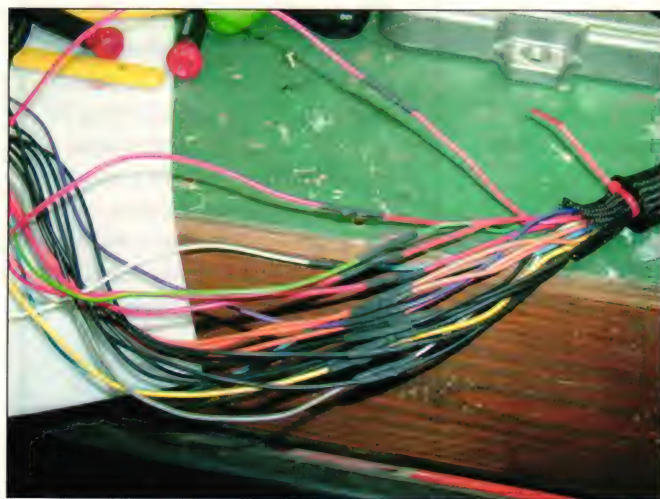
The next issue was connecting the drives, fans, and lighting. The original case fan—a 120mm medium CFM fan, mounted in a wind tunnel-like enclosure—was more than adequate, but Apple's proprietary connection terminated it. I would need to reterminate it with a standard Molex connector.

The existing power and reset switches were mounted on a system management-like module built on a small PCB located

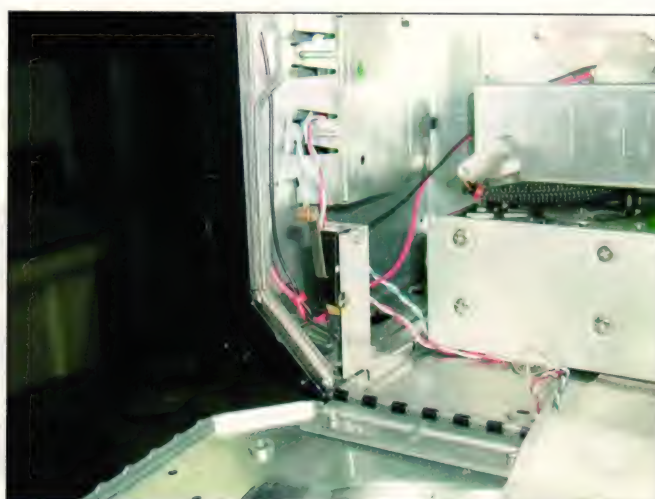
a “refrigerator” effect where the lights would come on when the case was opened. I found a roller switch assembly that suited my purposes. I needed to create a custom mount and wire it. Using some aluminum angle pieces, I created an adjustable mount bracket and secured it to the case's bottom.

Next I mounted the PSU and routed the ATX lead to the motherboard, running it underneath the front of the expansion cards to help hold it in place and keep the inside as neat as possible. I ran the power leads to their various components and installed the main case fan. Things were coming together.

The hard drive mount was one of the only pieces missing from the case, so I



Here you see the completed ATX extension. Make sure all wires are individually shrink-wrapped to prevent them from contacting each other in the cable. Electrical tape won't cut it; use heat-shrink tubing instead.



The light switch we installed is shown here. This switch will come in handy at dark LAN parties when we need to make any repairs, as we'll be able to just open the side of the box.

The goal was to preserve the ability to open the case side for last-minute LAN-party repairs and upgrades. This meant the ATX cable had to snake around inside the case to the ATX header on the motherboard when the case side was in the open position. To do this, I needed to extend the power lead. I cannibalized the extension from a dead power supply I had handy, and after a couple hours of soldering, a whole package of heat-shrink tubing, and two burned fingers, I extended the ATX power lead by about 14 inches.

Modifying the power connectors on a PC's power supply is risky; one wire connected wrong and you could quickly fry a

on the front panel inside the case. I used the existing switches but needed to solder standard leads from the switches mounted on the PCB to the motherboard headers. The interior lights—to provide light during emergency LAN party repairs—also needed to be wired to an automatic switch and have the leads shortened to the exact length to keep the clean look I was after. Finally, the PSU's power leads needed the small floppy connectors removed and the leads shortened to the proper length.

More soldering, several PSU disassemblies, and a handful of wire ties later and the PSU, fans, and switches were ready. The lights required more work; I was after

had to create a new one. I found a hanging dual-drive cage from another case that thankfully fit almost perfectly. Another tapped screw hole in the case's bottom and I was in business.

The final wiring job was to route the IDE cables from the top-mounted CD-ROM and Zip drive to the motherboard, as well as the cable for the two hard drives. I used the original cable from the Apple case for the top two drives but had to custom-make the cable for the hard drives. I was able to maintain the case-side accessibility and clean look inside by routing the cables down the case's side and across the bottom, keeping them flat against the metal

using double-sided tape. After routing the switch wires and mounting the lights and drives, I was ready for final assembly.

Step 4: Final Assembly

There wasn't much to the reassembly because I didn't modify any of the original body panels. Basically, I simply put everything back together the same way I removed it. I did, however, run into a couple of minor issues.

First, the case's interior chassis is galvanized steel. When I attached the clear carrying handles, the silver color was clearly visible and rather ugly. I removed all the panels and interior parts again and quickly painted the outside of the metal

The big project left was creating a custom ATX connector plate to cover the large opening at the case's back. The original plate would only fit an Apple motherboard and a standard plate wouldn't fit the case, so I had to fabricate a custom plate.

A trip to the local home-improvement store garnered a 0.0625-inch thick sheet of aluminum to make the plate with. I cut the ATX layout into a 4- x 16-inch sheet of aluminum using a standard ATX plate to trace the openings, along with some creative Dremel/scroll saw work. With careful measuring and more scroll saw work, I had a custom-fit ATX cover plate for the back of the G4's case.

To install the plate, I removed and separated the pop rivets holding the internal expansion card slot rails from the external plate that the bezel mounts to. I then slipped the

painted the bezel from the monitor, removing it from the monitor housing first.

With the case assembled, I proudly present The Rotten Apple. **CPU**

by Brian J. Holmes



The completed Rotten Apple, in all its glory.



All that power in such a small package—it looks fast just sitting there.

subcase with glossy black, making things look much better. I also painted the heads of the silver panel attachment screws black for a more uniform look.

Second, the Cooler Master model I was using came with a 1-inch thick fan installed. The top of the fan sat flush against the bottom of the PSU when the case was closed, completely cutting off air-flow to the heatsink. I rectified this by using a lower CFM fan from a server heatsink assembly, attaching it to the Cooler Master heatsink. Although this will reduce the heatsink's effectiveness, the large 120mm case fan should provide enough extra cooling to keep the chip cool.

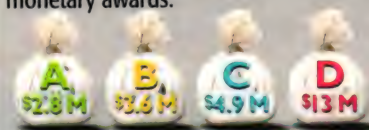
plate between the two and secured it with two screws in the upper corners.

What case would be complete without a matching 17-inch flat-panel monitor? While painting the clear side panels, I also

Infinite Loop

Match Game 2002: The Lawsuit Edition

Tech companies have faced numerous lawsuits this year. See if you can match the successful lawsuits with the monetary awards.



1. Mo' Money, a Pensacola, Fla., promotional item distributor, sued Gateway for inadvertently directing customer complaints to Mo' Money's toll-free phone number on the Gateway customer service Web site. After Mo' Money reported the problem, it took Gateway nearly two years to correct it. Mo' Money won.

2. Adobe Systems sued Macromedia, claiming the latter's Flash Web animation tool infringed on an Adobe patent. Adobe won.

3. Macromedia counter sued Adobe Systems, claiming Adobe infringed on three Macromedia patents. Macromedia won this round.

4. Lima, Ohio, based automotive and appliance parts manufacturer American Trim sued Oracle for selling it \$1.8 million worth of allegedly nonexistent software. American Trim won.

Answers: 1b; 2a; 3c; 4d

Muchas Gracias

Big thanks to the following sponsors for the components for this mod:

- Azzo Computers & Electronics (www.azzo.com): Zip drive, Western Digital hard drives, Cool Cold cathode lights, Cooler Master HSF, Allied 400W PSU, Intel 10/100/1000 NIC
- Corsair (www.corsairmicro.com): 512MB PC2700 memory
- EPoX (www.epox.com): EP-8KHM motherboard
- VisionTek (www.visiontek.com): Xtasy Geforce4 Ti 4600, Xtasy 48x CD-RW
- HardOCP (www.hardocp.com): AMD XP 2200+ CPU, CTX 17-inch flat-screen monitor, Philips Rhythmic Edge sound card, Apple G4 case



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Technically Speaking

An Interview With Yrjo Neuvo, Ph.D., Nokia Executive Vice President & CTO

High-speed handsets capable of delivering Web pages, full-motion video, and streaming audio are the holy grail of today's cellular market. Unfortunately, the technology, infrastructure, and cross-industry cooperation required to make the jump from today's slow, 2G cellular systems to tomorrow's 3G networks is mammoth in scope and vastly expensive. But the transition must happen if the cell phone business is to thrive.

With 37% of the market, Nokia is the leader in mobile handsets. What fewer people know is that the company is also one of the world's key cellular network vendors. Nokia began delivering 3G-infrastructure equipment in Q3 2001 and plans to accelerate deploying and helping to advance the 3G platform over the next several years. We spoke with Yrjo Neuvo, Ph.D., Nokia's executive vice president and CTO, for the inside scoop on 3G and the cellular industry.

by William Van Winkle

CPU: Define the difference between the 2.5G technologies being deployed today and true 3G networks.

Neuvo: With 2.5G, what usually is meant are enhancements to the existing 2G systems with more advanced data services and higher bit rates, still operating on the same radio spectrum. The existing 2G-network infrastructure is expanded with components necessary for the enhancements. Packet switching for data traffic is perhaps the most central characteristic of this phase. 3G systems in turn are completely new system standards, operating on new radio frequencies and requiring, to a large extent, new infrastructure.

CPU: What is EDGE, and, with only a 473Kbps maximum data rate, is it really a 3G technology?

Neuvo: EDGE, standing for Enhanced Data rates for Global (GSM) Evolution, is one of the components of the UWC-136 standard, which mainly TDMA operators proposed as a third-generation standard. To be officially recognized as a

3G technology, a technology must meet a set of specifications set by the International Telecommunications Union. EDGE is one part of ITU's family of 3G technologies. More detailed facts about EDGE can be found, for example, on the Web pages of ITU or 3G Americas. [www.itu.org; www.3gamericas.org/English/Technology_Center/QA/Edgeqa.cfm]

A word, though, on data rates since they are not a completely straightforward area: Too often, the public discussion focuses on the theoretical peak data rates specified for the transmission channel. The actual expected average throughput is what users will experience with their terminals, and these speeds are much lower. Also, in many systems the data rates can be varied by selecting a different coding scheme and using a different amount of time slots for the connection. For example, the theoretical maximum data rate for one EDGE timeslot is 59.2Kbps. The maximum number of time slots is eight, which then gives the mentioned maximum of 473Kbps. In practice, the amount of time slots used will be up to four, and the average expected throughput rate for user applications will be



somewhere around 100 to 160Kbps, depending on the amount of time slots used. As a comparison, for WCDMA the specified peak transmission rate is 2Mbps, but the average throughput is anything from 64 to 384Kbps.

CPU: Our understanding is that cellular network bandwidth is locally distributed among users within the closest tower's range, much like cable bandwidth in a neighborhood, and that this may further impact real-life data rates. Is this the case?

Neuvo: There is a key difference whether the connection is circuit- or packet-switched. In circuit-switched connections, the user always has a reserved channel completely for his own use with the announced data rate during the entire call, just like in wired telephone systems. The total capacity is allocated to the maximum number of users supported by one cell at a time, and new

calls cannot be accepted at all until some "line" gets freed up.

But packet-switched connections work as you mentioned, with several users sharing a common carrier, and a scheduler offers a connection when a user needs to transfer data. The scheduler algorithm determines the discipline of how individual users are served. Most cellular packet data systems offer the possibility to select different coding schemes and throughput classes, thus making it possible, for example, for operators to offer a guaranteed faster connection for a higher price.

Again, the data rates give the possibility for various interpretations. Very often the data rates cited for different technologies are referring to the specification peak data rates of the transmission channel. The practical throughput rate the user experiences is much lower.

An analogy to automotive performance is not far-fetched. Maximum speeds and horsepower are underlined in marketing discussions. In optimal test conditions a user can definitely use all the power in the vehicle, but the actual maximum speed is determined by many other factors, like speed limitations, weather conditions, amount of other traffic on the road, etc.

CPU: How important is handset-based person-to-person video communication going to be in the future?

Neuvo: We believe that mobile multimedia communication will definitely increase. The first steps are being taken just now, as MMS (Multimedia Messaging Services) messaging is on the uptake, enabling subscribers to instantly send snapshots taken with the in-built camera as parts of a multimedia message. A MMS message can also include video or audio clips. The first multimedia messaging phones from different manufacturers are just now starting to appear in the market.

Nokia believes strongly that multimedia messaging will become similarly popular as the SMS text messages have. Thus, yes, we believe that person-to-person video communication will be important. In the future, possibilities for real-time person-to-person videotelephony will also

become available. But it is still too early, if not practically impossible yet, to predict the importance of that in person-to-person communications.

CPU: We want to be able to receive a call on our home landline, pick it up with a cellular phone, and have the call seamlessly switch over to cellular when we walk out the door and get in our car, just like when moving between roaming cells. Is this possible, or is the market simply waiting for cellular to replace conventional landline technology?

Neuvo: The scenario you present is somewhat difficult to achieve, although not impossible. The challenges are not, however, technical but rather commercial and would require suitable operator pricing structures. Basically, it would mean that you sign up a contract with an operator where there would be some reduced rate for transferring your landline call to your cell phone.

But I have a strong feeling that this is a user expectation that will soon pass, and the personal cellular phone will become the first option to call everywhere. This has already happened in many high-penetration countries; there are already very many people with no landline phone at all. This is especially true for young people, students, young families with no children, and the like. After all, people want to call people, not places. Most homes, of course, have a landline, but the personal communication focuses on cell phones.

CPU: Why is the audio quality of cellular voice calling inferior to landline calls? Is Nokia working to make these equal?

Neuvo: This is not true anymore. The reason for the formerly inferior quality has been bandwidth limitations. Cellular connections have had a significantly narrower channel to use for their communication. This means that the digital speech signal must be heavily compressed in order to at all be able to fit in the

available channel. Thus, the audio codec is a very important element in the whole chain. In all digital standards, new and better codecs have been developed continuously and have been included in the standard. In current 2G digital networks, the speech quality in reasonable radio channel conditions is at least comparable and in many cases better than a typical landline connection.

Codec development continues in pace with everything else. Last year, the Wideband Adaptive Multirate codec (WB-AMR) developed by Nokia was selected to become the official codec for the WCDMA 3G standard. It doubles the audio bandwidth to 7KHz and offers a voice quality that is by far superior to the best landline connections.

CPU: Do you think that cellular technology has had an impact on people's behavior at a cultural or social level?

Neuvo: The impacts have already been enormous, which can best be observed in high-penetration countries. The fact that practically everyone carries a cell phone has very quickly changed the practices of day-to-day life. One key trend has been increased convenience. People now have, thanks to the mobile phone, more freedom in daily routines and planning. Nowadays, we do more planning on the fly and decide later. Physical location has less and less importance for many things.

Another significant influence has been social: The cell phone has provided a powerful means to boost the sense of being in constant contact with other people—friends, relatives, colleagues, various communities, etc. People less and less call places; they call persons. This has not only to do with actual phone calls, but now text messages have provided a completely new, instant, and powerful channel for communicating between persons and within groups. Networks of people have clearly received a boost with mobile phones. **CPU**

To read our entire interview with Yrjo Neuvo, go to
www.smartcomputing.com/cpumag/oct02/neuvo

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Under Development

A Peek At What's Brewing In The Laboratory

Fresh from the most influential R&D labs around the world, here's a glimpse at some of the technology that scientists, lab techs, and researchers are cooking up for the future.

Touch Your Co-Workers

Anyone who has used NetMeeting knows computers have a way to go before they can rival the experience of pushing paper back and forth across a conference table. And even with whiteboards, where does the data go after the meeting? Hopefully, somebody took a picture of the screen for posterity.

Daniel Russell, IBM User Sciences and Experiences Research lab senior manager, knew there had to be a more efficient, intuitive way for groups to communicate and collaborate. Enter IBM Research's BlueBoard, a fast, simple method for checking personal and group data. With BlueBoard, a user walks up to a 1.3-meter touch-enabled plasma screen, and a sensor

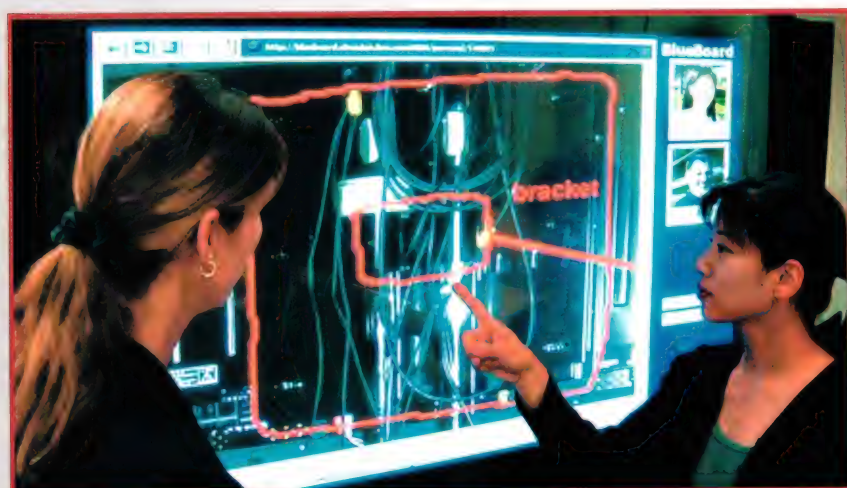
detects the user's RF identification badge. The user is authenticated, and a personal intranet home page immediately pops up. A tap on the user's personal icon, or p-con, brings up appointments, pending mail, and other PIM data within five seconds. Several people can use a BlueBoard at once.

"With BlueBoard," says Russell, "you can look at and annotate PDFs, drag in graphics from the Web. But then what if I want to save that project? With a whiteboard, you're dead in the water. With BlueBoard, all I have to do is drag the information with my finger over to another user's icon and it emails it to her as an attachment."

BlueBoard's really brilliant part is its platform, driven by IBM's WebSphere Portal Server. With the server infrastructure in place, any display can be touch-enabled and made to act as a BlueBoard thin client, such as an Office Depot kiosk, television in a hotel room, or a monitor screen.

NASA realized the BlueBoard technology was ideal for the planning behind its MER (Mars Exploration Rover) expeditions scheduled for 2003. NASA groups work at a frantic pace and need to hand off information instantly to the team coming on for the next shift. The first "MERBoard" trials were scheduled for August. IBM hopes the technology will prove invaluable in the corporate world and filter down into everyday use.

"The 10-year vision is to put this on every display in the world," says Russell. "All that PC interface and VPN hassle inherent in collaboration today goes away. We have so much software that is not intuitive. But if I can give you a new capability you can learn in four minutes, that's a great win." ▲



IBM's BlueBoard technology can turn any screen into a touch-sensitive thin client, letting users and workgroups quickly collaborate and manage their information without the conventional hassles of videoconferencing or whiteboards.

Roll Out The

Imagine plastering a 100-inch monitor on your office wall or sewing a 6-inch-wide television screen into your jacket sleeve. Or perhaps keeping a folded screen in your car's glove box and bringing it out to flash creative, graphical messages of warmth and appreciation when people cut you off in traffic.

Flexible-display technology has been a staple of next-gen vaporware for more than a decade, but this year the dream of roll-up screens may become a reality.

CDT (Cambridge Display Technology) was founded in 1992 to develop and commercialize LEP (light-emitting polymer) technology, one of two modern forms of OLEDs (organic light-emitting diodes). Unlike conventional LCDs, LEPs don't require a backlight. The substance itself

Keeping Quantum Computing Cool

The potential advantages of quantum computing all rely on quantum bits, or qubits. A bit in the transistor world either carries a binary 0 or 1 state. A qubit can be 0, 1, or both at the same time, a state known as superposition. With superposition, you can store numbers in parallel to perform vastly more powerful computations.

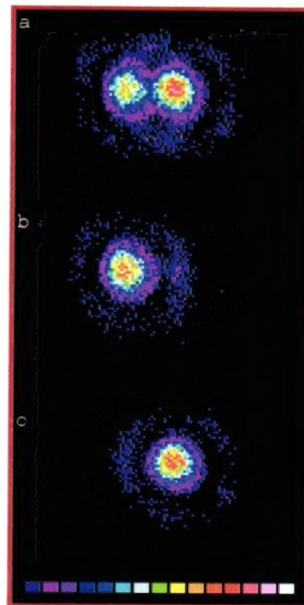
"If you had 300 atoms, you could in principle store all 2^{300} numbers in that one device," says Christopher Monroe, a professor at the University of Michigan. "Now, 2^{300} is like 10^{90} —a 1 with 90 zeros behind it. That number is more than the number of particles in the universe. So even if every particle in the universe were dedicated to being part of a regular computer, it wouldn't have the memory of 300 atoms in a quantum computer. However, storing all these values in parallel is only useful if you can look at the information, and there are only a few algorithms which will let you do that."

One such algorithm allows for factoring of numbers. Because factoring is the fundamental method necessary for cracking today's most powerful encryption, researchers and government interests want to see the technology advance. Superposition can only happen under extremely special conditions. There can be no interference from the

outside world, even light. (One of the paradoxes of quantum mechanics is that when you observe a particle, the interaction with the outside world forces the particle out of its quantum state.) The challenge is keeping quantum particles completely isolated from the outside world to study and use them for computing.

Maintaining superposition also requires keeping particles very cold and still. This is hard to do with one atom, but scientists must devise ways to manipulate scores of atoms simultaneously. This is a problem Monroe's team is tackling. So far, it has worked with five atoms at once inside of a cleverly designed trap.

"The atoms are levitated by electric fields and held in the trap," says Monroe. "Because they have a net excess positive charge, they repel each other, just like magnets. If you have two atoms, they want to go right to the middle, like a marble in a bowl. Well, if you have two marbles in the bowl that repel each other, they both can't be at the bottom. They form an equilibrium



Advances in atom trapping and manipulation by University of Michigan researchers put us one step closer to usable quantum computers. The top row shows two isotopes fluorescing from the application of their respective laser-cooling beams. In the latter two rows, the unfluoresced atom is held in place by directly laser-cooling the other atom.

spacing. The forces balance, and they form a little crystal at an atomic scale. With lasers, we focus on, say, one of the two atoms,

and we wiggle it with the force of the laser in such a way that the other atom also feels that force. It turns out when you do that you can make certain interesting 'entangled' quantum states. Entanglement is at the heart of quantum computing. It's what makes a quantum computer all-powerful, but to make an interesting quantum computer you want hundreds, if not thousands, of atoms."

When will all this happen? Probably not in this decade, says Monroe. His hope is the field will develop algorithms to apply quantum computing to more tasks. ▲

Flex-Screens

glows in shades of red, green, or blue when supplied with power. This enables the displays to be brighter than today's flat panels and viewable from any angle. And unlike the material-heavy, complex production process for LCDs, LEP screens are made simply by inkjet printing the substance onto a glass or plastic substrate.

In June 2000, CDT worked with Seiko Epson to demonstrate the first full-color active-matrix inkjet-printed display that measured only 2.5mm thick. A year later, the same team showed a 2.8-inch diagonal screen with 100ppi resolution. In 2002, Toshiba demonstrated a



DuPont is the manufacturing partner for Cambridge Display Technology's flexible LEP screens. Prepare to trade in your bulky glass screens for lightweight, plastic films you could sew into clothing or tack up like a poster.

full-color 17-inch inkjet-printed LEP, which opens the door for tomorrow's notebook displays.

OLEDs are used in everything from PDA displays to stoplights. With the unique flexibility, however, LEP displays are poised for everything from ultralight runner's watches to fold-up tactical maps for battlefield soldiers. Apart from increased versatility, LEPs also promise to make displays far more affordable.

"The real long-term value for flexible displays will be in the roll-to-roll manufacturing techniques used to produce them, which will lower the cost and drive the market," says Stewart Hough, CDT's vice president of business development. "Although commercialization of flexibles is still a bit out, LEPs are making their way into the market now. Philips has begun shipping shavers with LEP readouts, and orders for MP3 players from Delta Optoelectronics are being taken. Other CDT licensees have announced they will be providing LEP displays for cell phones over the next couple of years." ▲

Back Door

Q&A With Michael Robertson

As the founder and CEO of MP3.com, Michael Robertson sought to drag the music world into the 21st century. Ultimately, his efforts to innovate and invigorate the field drew the wrath of the recording industry, which pounded MP3.com into submission until Robertson sold his brainchild to Vivendi Universal. Now Robertson is back with a new venture, Lindows.com, an affordable, Everyman's Linux distribution backed by one of the most aggressive, promising software marketing plans ever seen in computing and one which may ultimately pose a serious threat to Microsoft's industry dominance.

Q What kind of experience did you go through when MP3.com lost its legal battle?

ROBERTSON: Well, we were found guilty of willful copyright infringement and were fined astronomical sums of money. [The prosecution] set up some amazingly tough defensive laws that didn't require them to prove any damages whatsoever but still be eligible for literally billions of dollars of damage awards, which is just crazy. People need to understand that the severity of the loss was huge. Advisors said, "That's it. Your company's bankrupt. You're done." That triggered a whole wave of shareholder lawsuits, etc. etc., which, as has been seen from Enron and Arthur Andersen, can very easily put companies into a death spiral.

So with that as a backdrop, when we got sued, it was a very dark day for me and for the company. When we lost, I flew back to my company in San Diego and relayed the bad news. But I told them I would do everything possible to make sure that we came out of this. Fortunately, I'm an eternal optimist, so I told everyone to go home, take the weekend to be pissed off and sad and angry and disappointed and then come back to work Monday with fresh attitudes and conviction to get this company to a good place.



Q How much does the Lindows operating system cost?

ROBERTSON: Well, people can go to our Web site, Lindows.com, and buy the operating system for \$99. But what they should know is that also includes membership for a year to our warehouse of software programs, which now has over 1,000 titles. In the past, you had to buy an operating system and then spend hundreds of dollars more for individual software titles. We changed that model so it's all moving to one flat fee.

Also, if you've ever tried to install software on a Linux computer, it's typically a tremendously challenging task. It's not generally like the Windows experience where you download an EXE, double-click, OK, OK, it does some installing, and it works. What we've done with our Click-N-Run is you simply point at an icon, a progress bar goes across the screen, it says "Done," and you can run it. We've actually kind of leapfrogged even where Windows users are at today.

Q So the primary user of a Lindows system is looking for basic productivity and Internet apps?

ROBERTSON: Well, yes, I think that's pretty fair, although there are more and more Linux games every day. I think that when

there are more computers around you, a lot of computing time becomes more specialized. So you might have a computer where you mainly do your personal finance and that kind of stuff, but when we look at games in particular, we see a huge shift going toward consoles and making the PC a less critical gaming platform.

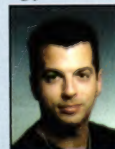
Q It must have been very gratifying when you finally beat Microsoft in court and kept the right to use the name Lindows.

ROBERTSON: Yeah, we joked around, "I'm now 1 for 37!" [laughs] You learn a lot when you lose. I got a hell of a lot of grief courtesy of the MP3.com experience. But that allowed us to play Microsoft tough.

See, I was a pure technologist, and technologists believe the best technology will win. We look at the courts and say that's an arbiter of justice, right? That's a last resort if you just can't get it settled. Well, that may be true and may be the way technology companies look at the world, but it's not the way that a lot of industries, specifically the entertainment industry, look at the world. They use the legal system as a business weapon. That's been a shock to all the digital music companies, and it's one of the reasons they've all been absolutely pounded. They lack experience in that area, and the music industry has taken great advantage of that. But when Microsoft wanted to tangle with Lindows.com, we weren't novices. We knew how the game was played and we were able to put up a strong defense.

For our complete interview with Michael Robertson, go to www.smartcomputing.com/cpumag/oct02/robertson.

William Van Winkle began writing for computer magazines in 1996. He was first published in 1990, the same year he took his first job in computers. He and his family live outside of Portland, Ore.





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